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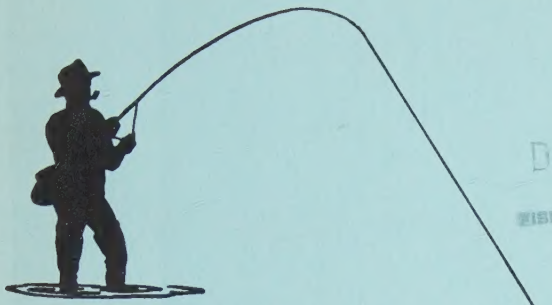

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SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of published articles on limnology, ecology, natural history and other fields of specialization are included when the subject has application to the conservation and management of sport fishery resources.

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17737. Alexander, J. E., J. Foehrenbach, S. Fisher, and D. Sullivan (N. Y. Ocean Science Laboratory, New York). 1973. MERCURY IN STRIPED BASS AND BLUEFISH. N. Y. Fish Game J., 20(2): 147-151.

Bluefish and striped bass taken in the vicinity of Montauk Point on Long Island were analyzed for mercury content. In both species, there was a correlation between mercury and weight. Bluefish weighing less than 2.4 kilograms had concentrations of mercury below 0.5 milligrams per kilogram, while in those between 2.4 and 5.6 kilograms the concentration fluctuated above and below that level. All fish weighing more than 5.6 kilograms contained mercury in excess of 0.5 milligrams per kilogram. The corresponding weight categories for striped bass were: less than 3.2 kilograms; between 3.2 and 5.7 kilograms; and more than 5.7 kilograms, respectively. (Authors)

17738. Aprieto, Virginia L. (Coll. of Fish., Univ. of the Philippines, Quezon City, Philippines). 1974. EARLY DEVELOPMENT OF FIVE CARANGID FISHES OF THE GULF OF MEXICO AND THE SOUTH ATLANTIC COAST OF THE UNITED STATES. NOAA Fish. Bull., 72(2): 415-443.

Larvae of round scad, Decapterus punctatus; rainbow runner, Elagatis bipinnulata; banded rudderfish, Seriola zonata; lookdown, Selene vomer; and leatherjacket, Oligoplites saurus, collected in the Gulf of Mexico and off the south Atlantic coast of the United States are described and illustrated. Larvae 2 to 3 mm long show general family characteristics but generic and specific characters are differentiated in later stages. Morphological features including supraoccipital crest, thickness of the first interhemal spine, and body indices; meristic characters; mode of development and modification of the dorsal and pelvic fins; and patterns of pigmentation are useful in distinguishing the family, genera, and species. Information on distribution and spawning is included. (Auth.)

17739. Sunada, John S. 1974. AGE AND GROWTH OF THE PACIFIC SAURY, Cololabis saira. Calif. Fish and Game, 60(2): 64-73.

Age, sex ratio, maturity, age composition, and length-weight relationships of Pacific saury, Cololabis saira, were studied using samples collected from waters off southern Oregon to central Baja California. Lengths ranged from 45-300 mm FL. Age was determined from otoliths, and length frequency distributions were used to validate the otolith method. Of the 237 sauries whose ages were determined, 57% were Age Group II fish ranging from 208-276 mm FL. Sexual maturity was most developed during winter and spring months. The calculated length-weight relationship of unsexed fish is: weight = $0.00008309L^{3.19591}$. Female to male ratio was 1.1 to 1. (Auth.)

17740. Kanep, S. V. (State Res. Inst. for Lake and River Fisheries (GosNIORKh), Leningrad, USSR). 1973. GENERAL FEATURES OF THE GROWTH, MATURATION AND FECUNDITY OF THE PELYAD [Coregonus peled (Gmelin)]. J. Ichthyol., 13(1): 79-89.

Investigations have been made of the nature and rate of growth, the conditions and time of sexual maturity and the fecundity of the pelyad [Coregonus peled (Gmelin)], which is widely acclimatized in bodies of water in different geographic zones of the USSR. It has been noted that there is considerable acceleration in the growth of the pelyad in connection with an increase in the duration of the vegetation period and enrichment of the food resources. The earliest sexual maturity at an age of 2 years is dependent on growth rate. The fecundity of individual pelyad is related to their weight. The connection between the statistics obtained and the conditions of life of the pelyad is discussed.

17741. Williams, D. Dudley, and N. E. Williams (Dept. of Biol., Univ. of Waterloo, Waterloo, Ontario, Canada). 1974. A COUNTERSTAINING TECHNIQUE FOR USE IN SORTING BENTHIC SAMPLES. Limnol. Oceanogr. 19(1): 152-154.

Two staining techniques for use in benthic sample sorting are described. The primary stain, rose bengal or Lugol's iodine, is counterstained with chlorazol black to provide a high color contrast between the animal and detritus fractions of such samples. (Authors)

17742. Kendall, M. W., and D. E. Hinton (Dept. of Anatomy, School of Med. and Water Resources Lab., Univ. of Louisville, Louisville, Kentucky). 1974. RENAL TUBULAR MORPHOLOGY IN THE CHANNEL CATFISH (Ictalurus punctatus) KIDNEY. J. Fish. Res. Board Can., 31(3): 346-347.

Kidneys of 50 channel catfish (Ictalurus punctatus) (25-30 cm long) obtained from a fish hatchery were subjected to light microscopic examination. All renal tubular segments generally found in freshwater teleost kidney were present. These included a ciliated neck segment, bisegmental proximal segment, ciliated intermediate segment, distal segment, and in addition, collecting ducts. (Authors)

17743. Lockwood, Stephen J. (Fisheries Lab., Lowestoft, Suffolk, England). 1974. THE USE OF THE VON BERTALANFFY GROWTH EQUATION TO DESCRIBE THE SEASONAL GROWTH OF FISH. Journal du Conseil, 35(2): 175-179.

The von Bertalanffy growth equation was used to fit a curve to the observed mean lengths of plaice during the O- and I-group growth periods. The regression of growth increment per unit time on median length for time interval Δt gave the best estimate of the growth parameters k, the slope, and L_n, the intercept value on the x axis. L_n is substituted for L_∞ to avoid confusion; n is the age of the fish in years at the end of the growth period. There is a short interval at the start of each growth period, when the growth rate is increasing, which is not adequately described by the von Bertalanffy equation. The method was used to describe the annual growth curve of O- to I-group plaice and I- to IV-group brown trout. (Auth.)

17744. Bruger, Gerard (State of Fla. Dept. of Nat. Res., 100 Eighth Ave., S.E., St. Petersburg, Florida 33701). 1974. AGE, GROWTH, FOOD HABITS, AND REPRODUCTION OF BONEFISH, Albula vulpes, IN SOUTH FLORIDA WATERS. Fla. Mar. Res. Publ. No. 3.

Life history and biology of bonefish, Albula vulpes, were studied from 170 specimens collected from anglers in the Lower Florida Keys between February 1970 and June 1972 and from 36 museum specimens. Of 205 sets of scales examined for age evaluations, 183 sets (89.3%) were readable. The oldest fish encountered was a 12 year old female, 620 mm fork length (24.4 inches) weighing 4196 grams (9.25 pounds). Ages greater than 12 years may be expected. The relationship of scale radius to standard length is linear, r = 0.988. Use of marginal increments to determine time of annulus formation was inconclusive. No single time can presently be fixed for annulus formation of the population; only for single individuals. Backcalculations of standard lengths for Age Classes I to IX were computed. Agreement between empirical and backcalculated lengths is shown, although empirical lengths are consistently larger since collections do not coincide with the precise time of annulus formation. Length-weight relationships were calculated for 169 fish (77 males, 88 females and 4 fish of undetermined sex). The relationship for all fish is expressed by the equations $W = 2.799 \times 10^{-5} SL^{2.9321}$ and Log W = 2.9321 Log SL - 4.5529. Sexes were also considered separately and their equations presented. Scale radius-standard length, length-weight and backcalculation data all suggest a change in growth rate at approximately 300-400 mm standard length (Age Class III-IV). Standard and fork lengths are highly correlated (r = 0.999); the relationship is expressed by the equation FL = 1.07 SL. Crustaceans, principally penaeid and alpheid shrimp and portunid and xanthid crabs, found in 73% of stomachs, predominated as food items. Noncrustacean items, including fish and fish remains (present in 15%), mollusks (present in 28%) and miscellaneous material contributed little either numerically or volumetrically. Nineteen stomachs (15%) were empty or contained no recognizable food items. Stomachs of many bonefish were parasitized by acanthocephalid worms tentatively identified as Dollfusentis heteracanthus (Cable and Linderoth). Microscopic examination of histologically prepared gonadal sections was used to describe oogenesis and spermatogenesis and to thereby determine spawning time. Ripe and near-ripe males and females are present throughout the year, indicating that year-round spawning may occur. (Auth.)

17745. Bartoo, N. W., R. G. Hansen, and R. S. Wydoski (Wash. Coop. Fish. Unit, Univ. of Wash., Seattle, Wash. 98195). 1973. A PORTABLE VERTICAL GILL-NET SYSTEM. Prog. Fish-Cult., 35(4): 231-233.

17746. Guthrie, J. F., and R. L. Kroger (NMFS, Atlantic Estuar. Fish. Center, Beaufort, North Carolina). 1974. SCHOOLING HABITS OF INJURED AND PARASITIZED MENHADEN. Ecology, 55(1): 208-210.

We determined from fish collections made along the Atlantic and Gulf coasts that adult menhaden, genus Brevoortia, which school with juvenile menhaden in estuarine nursery areas are usually injured or are parasitized with the isopod Olencira praegustator, whereas adults in the ocean, bays, and sounds are undamaged. Olencira praegustator appears to be debilitory to menhaden, but the copepod Lernaeenicus radiatus does not, except when the fish are heavily infested. When many injured and parasitized adult menhaden are present in an estuary, they form schools independent of the juveniles. Large injured juveniles remain in the nursery areas longer than similar-sized healthy juveniles, and school with the remaining small juveniles. (Authors)

17747. Chung, Huu-Yun, and Guang-Hsiung Kou (Dept. of Zool., Coll. of Sci., National Taiwan University, Taiwan). 1973. STUDIES ON THE BACTERIAL FLORA OF FISH BODY--I. BACTERIA IN GILL, INTESTINE, BLOOD AND VISCERA OF APPARENTLY HEALTHY POND-CULTURED EELS. J. Fish. Soc. Taiwan, 2(2): 20-25; NOAA Marine Fish. Abstracts, 27(5): p. 3, 1974.

One hundred and eight apparently healthy eels from ponds in Taoyuan, Roatung, Lukang, and Pingtung were collected and examined for the presence of aerobic bacteria in their gills, intestines, blood, and viscera. Three hundred and ninety cultures were isolated from these organs and were classified into the following groups: Aeromonas, Pseudomonas, Enterobacteriaceae, Vibrio, Flavobacterium, Achromobacter-Alcaligenes, and unidentified gram-negative rods. The first three groups were the most predominant. Of 106 strains examined, 26 were found to be virulent; most of these were Aeromonas (20 strains).

17748. Merna, J. W., and P. J. Eisele (Mich. Dept. of Nat. Res., Ann Arbor, Michigan). 1973. THE EFFECTS OF METHOXYCHLOR ON AQUATIC BIOTA. Environ. Protection Agency Ecological Res. Series Report EPA-R3-73-046, 59 p., available from GPO Sup. Doc. as EP1.23:73-046, $0.95; Selected Water Resources Abstracts, 7(9): p. 66, 1974.

Continuous-flow bioassays yielded 96-hour TL50 values for invertebrates ranging from 0.61 microgram/l for Gammarus pseudolimnaeus to 7.05 microgram/l for Orconectes virilis. Fathead minnows (Pimephales promelas) and yellow perch (Perca flavescens) had 96-hour TL50 values of 8.63 and 22.2 micrograms/l respectively. Hatching of fathead minnow eggs was inhibited at all levels of exposure tested between 1.0 and 0.125 microgram/l. There was no spawning at 2 microgram/l. Growth of yellow perch was retarded at all levels tested between 5.0 and 0.625 micrograms/l. All perch died at 10 micrograms/l during the growth study. Perch which had been subjected to long-term exposure to 5 microgram/l of methoxychlor had an abnormally high oxygen demand when held in a respirometer with a water velocity of 0.6 foot per second.

17749. Holmes, Donald W., Vaughn M. Douglass, and Robert T. Lackey (Va. Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1974. POND AND CAGE CULTURE OF CHANNEL CATFISH IN VIRGINIA. J. Tenn. Acad. Sci., 49(2): 74-78.

Experimental pond and cage culture of channel catfish (Ictalurus punctatus) (1970 and 1971) were used to predict if marketable-size (>340 g) fish could be successfully grown in existing south-central and western Virginia ponds in one growing season. Results from pond culture experiments indicate that marketable-size channel catfish can be raised in one growing season if the initial stocking size is at least 150 mm. Cage culture showed promise as a catfish rearing method, but several problems were encountered. Most fish did not reach marketable size in one growing season partly because they were less than 150 mm when stocked. The lack of a nutritionally-complete feed hindered growth in 1970, but this problem appeared to be solved in the 1971 growing season with the use of Purina Cage Catfish Chow. Low dissolved oxygen and poor quality cages were other problems. Although this work is experimental, it is probable that marketable-size catfish can be grown in the piedmont region of Virginia using cages. (Authors)

17750. Middaugh, D. P., and C. L. Rose (Nat. Mar. Water Qual. Lab., Bears Bluff Field Site, Johns Island, South Carolina). 1974. RETENTION OF TWO MERCURIALS BY STRIPED MULLET, Mugil cephalus. Water Research, 8(3): 173-177.

The uptake and retention of phenyl mercuric nitrate (PMN) and mercuric chloride ($HgCl_2$) were studied in Mugil cephalus, the common saltwater mullet. Fish were exposed to calculated doses of 10, 50, 100 and 500 parts per billion (ppb) mercury of each toxicant in seawater for three hours. Thereafter, they were held in tanks with flowing seawater for 216 h. Fish were sacrificed at 72 h intervals during the holding period to determine levels of mercury in gill, liver and muscle tissues. Higher mercury levels were found in mullet exposed to PMN than in those exposed to equivalent concentrations of $HgCl_2$. No deaths occurred among mullet dosed with $HgCl_2$ whereas 58 percent of those exposed to the highest level of PMN died within 21 h of exposure. Mercury levels detected in tissues appeared to be related to the toxicant used, dose levels, and time of sampling after exposure. (Authors)

17751. Biesinger, K. E., R. W. Andrew, and J. W. Arthur (U.S. Environ. Protection Agency, Natl Water Qual. Lab., Duluth, Minnesota 55804). 1974. CHRONIC TOXICITY OF NTA (NITRILOTRIACETATE) AND METAL-NTA COMPLEXES TO Daphnia magna. J. Fish. Res. Board Can., 31(4): 486-490.

The chronic toxicity of NTA (nitrilotriacetate) tested as the trisodium salt, to Daphnia magna in eight natural waters varied tenfold. A strong negative correlation ($r = 0.95$) between water hardness and NTA toxicity was found; NTA was most toxic in water with a total hardness of 22 mg/liter and was least toxic in water with a total hardness of 438 mg/liter. The 21-day LC50 in all cases closely approximated the calculated molar equivalence point of total hardness and NTA. Bioassay experiments of NTA, with copper and zinc added, confirmed earlier reports that chelates of copper and zinc with NTA are relatively nontoxic. The solutions were toxic only when the metals or NTA were present in excess. The toxicity of iron (III) was not appreciably changed by NTA chelation. (Authors)

17752. Hara, Toshiaki J., M. Freese, and K. R. Scott (Fish. Res. Board Can., Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada). 1973. SPECTRAL ANALYSIS OF OLFACTORY BULBAR RESPONSES IN RAINBOW TROUT. Jap. J. Physiol., 23, pp. 325-333.

The olfactory bulbar responses induced by chemical stimulation of the nares of rainbow trout were computer analyzed into frequency components. The spontaneous activity of the bulb was predominated by low-frequency components (2-6 Hz). Upon stimulation this immediately shifted to high-frequency components (7-11 Hz). The peak frequency pattern was characteristic of each single chemical tested regardless of the stimulus intensity. Multi-peak spectra were obtained on stimulation with compound stimuli such as food extract. The frequency component coding mechanism for olfactory receptive discriminatory function in the olfactory bulb is discussed. (Authors' summ.)

17753. Tsuda, Roy T., and Harry T. Kami (The Marine Lab., Univ. of Guam, Agana, Guam 96910). 1973. ALGAL SUCCESSION ON ARTIFICIAL REEFS IN A MARINE LAGOON ENVIRONMENT IN GUAM. J. Phycol., 9(3): 260-264.

Algal succession on artificial reefs constructed of tires has been studied over a 26-mo period. Filamentous algae, i.e., Calothrix crustacea, Feldmannia indica, and Sphacelaria tribuloides, are the primary colonizers; the fleshy brown alga, Dictyota bartayresii, appears soon after. Lobophora variegata is the only alga present which occurs seasonally. Low light penetration through the silty lagoon water and selective browsing by herbivorous fishes favor the blue-greens Calothrix crustacea and Microcoleus lyngbyaceus to be the dominant algae in the climax community which occurs within a 1-year period. (Authors' summ.)

17754. Ross, David F. 1974. TUBERCULATION OF THE SILVERJAW MINNOW, Ericymba buccata. Copeia No. 1, pp. 271-272.

17755. Benke, G. M., K. L. Cheever, F. E. Mirer, and S. D. Murphy (Dept. of Physiol., Kresge Center for Environ. Health, Harvard Univ. School of Public Health, Boston, Massachusetts). 1974. COMPARATIVE TOXICITY, ANTICHOLINESTERASE ACTION AND METABOLISM OF METHYL PARATHION AND PARATHION IN SUNFISH AND MICE. Toxicol. Appl. Pharmacol., 28(1): 97-109.

The in vitro metabolism of methyl parathion (O, O-dimethyl O-p-nitrophenyl phosphorothioate) and parathion (O, O-diethyl O-p-nitrophenyl phosphorothioate) and the sensitivities of the target cholinesterases to inhibition by their oxygen analogs were studied in sunfish (Lepomis gibbosus) and mice to determine the basis for the low toxicity of methyl parathion in sunfish (LD50 > 2500 mg/kg). The LD50 values of parathion and methyl parathion in mice were 13.5 and 11 mg/kg, respectively, and the times to death were much shorter for both compounds in mice than in fish. Low sensitivity of fish cholinesterases to paraoxon as compared to mice accounted for the 10-fold lower toxicity of parathion in fish (LD50, 110 mg/kg). By contrast, sunfish had similar cholinesterase sensitivities to methyl paraoxon and paraoxon. Differences in rates of oxidative formation of the oxygen analog or oxidate cleavage to p-nitrophenol and the corresponding dialkyl thiophosphate could not account for the selective resistance of sunfish to methyl parathion toxicity. Fish and mouse liver homogenates catalyzed a glutathione (GSH)- dependent metabolism of methyl parathion and methyl paraoxon but not of parathion or paraoxon. Additionally, hydrolysis of methyl paraoxon by fish liver homogenates exceeded that for parathion by 5-fold, while methyl paraoxon hydrolysis in mice was one-half of that of paraoxon. Apparently, a longer time to death in fish provided the opportunity for GSH-dependent and hydrolytic detoxification, which favored methyl parathion and methyl paraoxon, this is apparently of less importance because of their high cholinesterase sensitivity and because cleavage and hydrolysis favored parathion and paraoxon. (Authors)

17756. Weis, Peddrick, and Judith S. Weis (Dept. of Anat., Coll. of Medicine and Dentristry of New Jersey, Newark, New Jersey). 1974. DDT CAUSES CHANGES IN ACTIVITY AND SCHOOLING BEHAVIOR IN GOLDFISH. Environ. Res., 7(1): 68-74.

Goldfish were exposed to one part per billion DDT in water for 7 days, then placed in clean water. After 3 days of exposure, groups of five showed significant increases in activity of individuals, school size and angular deviation. In response to a fright stimulus, treated schools scattered further and did not regroup as soon as did control schools. These effects were no longer evident 1 week after fish were transferred to clean water. The ecological significance of these results is discussed. (Authors)

17757. Stanton, R. H., and M. A. Q. Khan (Dept. of Biol. Sci., Univ. of Illinois at Chicago Circle, Chicago, Illinois). 1973. MIXED-FUNCTION OXIDASE ACTIVITY TOWARD CYCLODIENE INSECTICIDES IN BASS AND BLUEGILL SUNFISH. Pest. Biochem. Physiol., 3(4): 351-357.

Microsomal mixed-function oxidase (MFO) was characterized in liver of freshwater fishes, bass, Micropterus dolomieux and bluegill, Lepomis macrochirus, using the chlorinated cyclodiene insecticide aldrin as a substrate. The MFO activity of bluegill adults, bluegill fry, and bass fry using cyclodienes as substrates was compared with that of mouse. Aldrin epoxidase activity was found to be high in bluegill fry (73% of the activity in mouse) compared to bluegill adults (13% of the activity in mouse). Chlordene was found to be metabolized by both fish and mouse MFO to chlordene 2, 3-epoxide and 1-hydroxychlordene. Competitive inhibition between various cyclodiene substrates studied in mouse and fish showed that endrin was a potent inhibitor of aldrin epoxidation in vitro. (Authors)

17758. Villanueva, Julieta, and Frank Marcus (Inst. de Bioquimica, Univ. Austral de Chile, Valdivia, Chile). 1974. FISH LIVER FRUCTOSE 1, 6-DIPHOSPHATASE III. THE EFFECT OF TEMPERATURE ON THE REGULATORY PROPERTIES OF THE CARP (Cyprinus carpio) LIVER ENZYME. J. Biol. Chem., 249(3): 745-749.

17759. Mehrle, Paul M., and Richard A. Bloomfield (Fish-Pesticide Res. Lab., Bur. Sport Fish. & Wildl., Columbia, Missouri). 1974. AMMONIA DETOXIFYING MECHANISMS OF RAINBOW TROUT ALTERED BY DIETARY DIELDRIN. Toxicol. Appl. Pharmacol., 27(2): 355-365.

Dietary dieldrin dosages of 14, 43, 143 and 430 μg/kg body weight per day for 240 days altered ammonia detoxifying mechanisms and brain amino acid metabolism of rainbow trout. These dosages corresponded to 0.36, 1.08, 3.6, and 10.8 μg dieldrin/g food, respectively. Whole-body dieldrin residues in fish from the lowest 3 dosage groups were comparable to those found in fish from the aquatic environment. The brain concentrations of amino acids associated with ammonia detoxifying mechanisms, aspartate, glutamate and alanine, were significantly altered, as were the enzymes related to their metabolism. Brain glutamate dehydrogenase (GDH) activity was decreased by all doses of dieldrin, whereas liver GDH and brain glutamine synthetase activities were stimulated by all treatment doses. Brain ammonia concentrations increased in the groups given the 2 highest dosages. Mitochondrial morphology in liver cells was significantly altered by dieldrin treatment as determined by electron microscopy. Since GDH is an intramitochondrial enzyme, examination by electron microscopy gave further evidence that dieldrin significantly altered mitochondrial metabolism. A possible mode of action of dieldrin was proposed which suggests that dieldrin inhibits or decreases brain GDH activity followed by ammonia intoxication after liver GDH and brain glutamine synthetase activities are exceeded. The ammonia detoxifying mechanisms of fish seemed to be very sensitive to dieldrin; the "no-effect" dosage was below 14 μg/kg body weight per day (0.36 μg/g food). (Authors)

17760. Hannan, Herbert H., and William J. Young (Aquatic Station, SW Texas State Univ., San Marcos, Texas). 1974. THE INFLUENCE OF A DEEP-STORAGE RESERVOIR ON THE PHYSICOCHEMICAL LIMNOLOGY OF A CENTRAL TEXAS RIVER. Hydrobiologia, 44(2-3): 177-207.

A study was conducted to determine a physicochemical profile of a new deep-storage reservoir and to determine the influence of impoundment and thermal stratification in the reservoir on the physicochemical limnology of the parent river. The presence of thermal stratification from May through November caused the most significant change in water conditions. Of 23 parameters studied, 12 remained unchanged, 10 improved, and 2 deteriorated. The greatest downstream changes in water conditions from those upstream from the reservoir were a decrease in temperature, an increase of ammonia, and the presence of hydrogen sulfide during the period of thermal stratification. Ammonia did not increase to a level considered to be toxic to aquatic species. It could, however, serve as a nutrient for certain species of plants and result in a change in community structure. Water temperature downstream from the reservoir was always within the annual temperature range of the river upstream from the reservoir; however, the summer maximum in the tailrace was decreased to a temperature that could interfere with the normal life cycle of many species. (Authors)

17761. Barica, Jan (Fish. Res. Board Can., Freshwater Inst., Winnipeg, Manitoba, Canada). 1973. CHANGES IN WATER CHEMISTRY ACCOMPANYING SUMMER FISH KILLS IN SHALLOW EUTROPHIC LAKES OF SOUTHWEST MANITOBA. Reprint from: Proc. Symposium on the Lakes of Western Canada, pp. 228-242.

Four cases of fish kills following the collapse of heavy blooms of Aphanizomenon flos-aquae in shallow eutrophic lakes located in the Erickson area of Southwestern Manitoba are described. The sequence of events was similar in each case. Partial die-off of algae preceded the fish kills. Rapid degradation of algal cells and their metabolites played a crucial role in the subsequent chemical changes. Dissolved oxygen dropped from supersaturation levels to below those required by fish. Ammonia and orthophosphate concentrations increased rapidly, while changes in dissolved organic nitrogen, carbon and phosphorus were slight. On the average, particulate CNP fell to one-third and chlorophyll a to one fifth of their concentrations preceding the blooms. Total inorganic CO_2 concentrations reached their maxima before the fish kills. The recovery of normal chemical conditions and the

algal succession following the collapse of the Aphanizomenon bloom varied from lake to lake. This paper presents an evaluation of the fish kill mechanism from the viewpoint of water chemistry as a part of broader studies of aquaculture in Canadian winterkill lakes currently in progress. (Auth.)

17762. Pickering, Quentin H. (U.S. Environ. Protection Agency, Newtown Fish Toxicol. Lab., Cincinnati, Ohio). 1974. CHRONIC TOXICITY OF NICKEL TO THE FATHEAD MINNOW. J. Water Pollut. Control Fed., 46(4): 760-765.

Nickel (as the chloride salt) at concentrations ranging from 1.6 to 0.082 mg/l in a continuous-flow chronic bioassay had no effect on survival or growth of first-generation fathead minnows. A significant (P=0.05) reduction occurred at 0.73 mg Ni/l, however, in the number of eggs per spawning and the hatchability of these eggs. Also, the mean number of eggs per female was less at 0.73 mg Ni/l than at 0.38 to 0,082 mg Ni/l. Thus the maximum acceptable toxicant concentration (MATC) of nickel for the fathead minnow was between 0.73 and 0.38 mg/l. An application factor, obtained by dividing the MATC by the 96-hr TL_{50}, of 0.014 to 0.027 is proposed as a model for estimating toxicity of nickel for other species of fish and other types of water. (Auth.)

17763. Reynolds, William W., and Donald A. Thomson (The Pennsylvania State Univ. at Wilkes-Barre, Wilkes-Barre, Pennsylvania). 1974. ONTOGENETIC CHANGE IN THE RESPONSE OF THE GULF OF CALIFORNIA GRUNION, Leuresthes sardina (Jenkins and Evermann), TO A SALINITY GRADIENT. J. Exp. Mar. Biol. Ecol., 14(3): 211-216.

Larval and juvenile Gulf of California grunion, Leuresthes sardina (Jenkins and Evermann), hatched and reared in the laboratory, were subjected to salinity gradients in a Staaland salinity gradient device to determine their locomotive responses. Newly hatched prolarvae selected salinities in the range 15-24 °/oo, while late postlarvae and juveniles preferred salinities in the range 45-54 °/oo. Early postlarvae exhibited a bimodal preference, indicating that the behavioral change was in progress at that age. These behavioral responses may serve several functions in the physiological and behavioral ecology of the Gulf grunion. (Authors)

17764. Julshamn, K., and O. R. Braekkan (Govt. Vitamin Lab., Bergen, Norway). 1973. THE DETERMINATION OF COBALT IN FISH TISSUE BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. Atomic Absorption Newsletter, 12(6): 139-141; Selected Water Resources Abstracts, 7(10): p. 48.

A method is described for the determination of cobalt in fish. The samples were prepared for analysis by freeze-drying and homogenization. A portion of 10 g was pre-ashed with infrared heat and then ashed in a muffle furnace at 480C. The residue was dissolved in 0.1 N hydrochloric acid, chelated with ammonium pyrrolidine dithiocarbamate, extracted with methyl isobutyl ketone, and analyzed by atomic absorption spectroscopy. Levels down to 0.01 microgram cobalt per g of fish tissue may be estimated with an average recovery of 96 percent and a coefficient of variation of 5.7-14.2 percent. (Holoman -- Battelle)

17765. Jean, Ronald, and E. T. Garside (Dept. of Biol., Dalhousie Univ., Halifax, Nova Scotia, Canada). 1974. SELECTIVE ELEVATION OF THE UPPER LETHAL TEMPERATURE OF THE MUMMICHOG Fundulus heteroclitus (L.) (CYPRINODONTIDAE), WITH A STATEMENT OF ITS APPLICATION IN FISH CULTURE. Can. J. Zool., 52(4): 433-435.

The highest median lethal temperature (LT_{50}) reported for mummichog Fundulus heteroclitus in a 10000-min bioassay is 36.31 (+ 0.19, - 0.18 SD) in isosomotic medium (14 °/oo salinity (S)) after acclimation to 25C and 14 °/oo S. Results of a subsequent confirming bioassay on large samples are in accord with that value. Survivors of the confirming test were acclimated again to 25C and 14 °/oo S and the LT_{50} was determined again in the same conditions. There was a significant increase in the upper lethal temperature of 1.22 C, to 37.53C $\pm$ 0.05 SD. The application of this simple selective procedure for more thermally tolerant genotypes in fish culture is discussed. (Authors)

17766. Hagen, H. K. (Dept. of Fish. & Wildl. Biol., Colo. State Univ., Fort Collins, Colorado). 1973. FISH BEHAVIOR RELATED TO THERMAL POLLUTION. In: Environmental Impact on Rivers (River Mechanics III), edited and published by Hsieh Wen Shen, Fort Collins, Colo., Chapter 11, p. 11-1 -- 11-23; Selected Water Resources Abstracts, 7(8): p. 51, 1974.

Fish behavior is discussed as related to thermal pollution. Because coldblooded animals cannot change their body temperature by losing water vapor in expired air or in sweat as a warmblooded animal can, they are severely handicapped in an environment that might be subjected to rapid or extreme thermal fluctuations. The growth of fish is also closely related to temperature and has much narrower limits than the lethal boundaries. In most species the food consumption and growth rate will increase in a sigmoid pattern in response to temperature increases, but in many instances after a leveling is reached, any increase in temperature will cause a decrease in feeding and growth, or both, with a resulting, often rapid, decrease in body weight and stamina. Any temperature change will have an ultimate effect on fish. Of major concern in thermally polluted waters is the possible blockage of migrations by either anadromous or catadromous fishes. Fish and many of the invertebrates of the Firehole River in Yellowstone Park seem aware of the stability of heated water layers and maintain themselves only inches from scalding temperatures. Although layering is generally a function of volume and surface area, in several instances very resistant stratification occurs in no more than twelve inches of depth. In smaller streams such as Witch Creek, where some thermal discharges approached 20% of the streamflow, the boundary zones were distinct enough so that the fish could pass freely up and down the stream.

17767. Dutka, B. J., J. B. Bell, and D. L. S. Liu (Dept. of the Environ., Microbiol. Labs, Canada Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. MICROBIOLOGICAL EXAMINATION OF OFFSHORE LAKE ERIE SEDIMENTS. J. Fish. Res. Board Can., 31(3): 299-308.

In August 1972 divers collected cores from the Central and Western basins of Lake Erie for microbiological analysis. The cores were sectioned and examined for sulfur cycle bacteria, nitrogen cycle bacteria, total heterotrophs, iron oxidizing bacteria, insoluble organic and inorganic phosphate solubilizing bacteria. Eh, nitrogen, organic carbon, and percentage moisture determinations were also made. Data from these cores indicate that offshore sediments, not directly influenced by land inputs, contain similar, homogenously distributed bacterial populations which vary less than one order of magnitude between the sediment surface and the 5-cm level. (Authors)

17768. Schubel, J. R., A. H. Auld, and G. M. Schmidt. 1974. EFFECTS OF SUSPENDED SEDIMENT ON THE DEVELOPMENT AND HATCHING SUCCESS OF YELLOW PERCH AND STRIPED BASS EGGS. Chesapeake Bay Inst., The Johns Hopkins Univ. Special Report 35, Ref. 74-2, 12 p.

Yellow perch and striped bass eggs were incubated in suspensions of different concentrations of natural, fine-grained sediments. The results showed that in the laboratory concentrations of up to 500 mg/l did not significantly affect the hatching success of yellow perch or striped bass eggs, but that concentrations of 1000 mg/l did significantly affect their hatching success. (Authors)

17769. Mitans, A. R. (Baltic Fisheries Res. Inst. (BaltNIIRKh), Riga, UAAR). 1973. DWARF MALES AND THE SEX STRUCTURE OF A BALTIC SALMON [Salmo salar (L.)] POPULATION. J. Ichthyol., 13(2): 192-197.

An investigation has been made of the external appearance and the coefficient of maturity of the gonads in different groups of juvenile Baltic salmon (Salmo salar L.), of the sex and age structure of populations of parr and smolts and of the abundance of smolts and adult fish. Most of the male parr in the river mature as dwarfs which have a higher mortality before the downstream migration, but almost all of the survivors migrate to the sea, from where they may return as large spawners.

17770. Neville, G. A., and M. Berlin (The Inst. of Hygiene, Univ. of Lund, Lund, Sweden). 1974. IDENTIFICATION AND BIOTRANSFORMATION OF ORGANOMERCURIAL COMPOUNDS IN LIVING SYSTEMS. A REVIEW OF CURRENT UNDERSTANDING. Environ. Res., 7(1): 75-82.

The chemical basis for mercurial toxicity in various living systems is the overall concern of this review. Biotransformation of organomercurial forms of special concern to environmentalists, and structural evidence for derived mercurial moieties is discussed in the perspective of evolving understanding of biotransformation and methodological development. Identification of the mercurial forms in tissues, body fluids, and cellular bodies remains a necessary, but challenging, key to the understanding of mercurial toxicology. (Authors)

17771. Yamamoto, Kiichiro, Takao Morioka, Osamu Hiroi, and Masaaki Omori (Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1974. ARTIFICIAL MATURATION OF FEMALE JAPANESE EELS BY THE INJECTION OF SALMONID PITUITARY. Bull. Jap. Soc. Sci. Fish., 40(1): 1-7.

Intramuscular injection of acetone-dried pituitary glands of salmonid fishes was carried out in 1971 and 1972. A weekly injection of four chum salmon pituitaries or eight pink salmon pituitaries into silver eels (per Kg body weight) produced conspicuous growth of ovarian eggs up to about 1 mm in diameter. Maturity factors of the treated eels ranged from 40 to 72 percent. The oocytes corresponded to the migratory nucleus stage or pre-maturation stage. One eel treated with salmon pituitary naturally spawned a large number of mature eggs. Eels treated with hormones showed a striking increase in body weight with the commencement of maturation. The pattern of increase in body weight may be divided into four types. The coefficient of correlation between the maturity factor and increase in body weight was greatest in type A, followed by type B and D, but very low in type C. (Authors)

17772. Postuma, K. H. (Ryksinstitut voor Visserijonderzoek, IJmuiden, Netherlands). 1974. THE NUCLEUS OF THE HERRING OTOLITH AS A RACIAL CHARACTER. Journal du Conseil, 35(2): 121-129.

Significant differences between the size of the nucleus in the sagittal otolith of herring spawning at different seasons in the North Sea and the English Channel were demonstrated on material collected during the years 1964-1965 and 1968-1969. These data confirmed the results of Postuma and Zijlstra which showed that herring spawning early in the year have on average larger nuclei than herring spawning later. It appeared that the percentage of opaque nuclei in the different populations was inversely related to the mean nucleus size of these populations. Late autumn-winter spawning herring have on average higher percentages of opaque nuclei than herring spawning in early autumn. Within spawning populations nucleus size showed no relationship with length suggesting that differences in nucleus size distributions can only exist when the majority of herring spawns in the season in which they hatched. (Auth.)

17773. Adron, J. W., A. Blair, and C. B. Cowey (Inst. of Marine Biochem., St. Fittick's Road, Aberdeen AB1 3RA Scotland). 1974. REARING OF PLAICE (Pleuronectes platessa) LARVAE TO METAMORPHOSIS USING AN ARTIFICIAL DIET. NOAA Fish. Bull., 72(2): 353-357.

Newly hatched larval plaice were grown to metamorphosis using an artificial diet. The overall survival rate to metamorphosis was of the order of 20%. This compares with a survival rate of 38% in control larvae fed Artemia in a similar tank system. The preparation of the artificial diet is described. The main protein component was freeze-dried cod muscle and the diet contained 70.7% crude protein, 9.7% lipid, 7.9% ash, and 5% digestible carbohydrate. This food in particle sizes ranging from 180 to 355 μ was introduced automatically into the inflowing water of a cylindrical tank containing 200 yolk sac larvae. Water temperature was 10±2°C. After about 13-14 days a relatively high larval mortality occurred, leaving approximately 70 established feeding larvae. Unfed larvae in an identical control tank did not survive beyond this time. Once feeding had been established larval mortalities

were occasional and sporadic. Thirty-five days after commencement of the experiment some larvae began to metamorphose, and 56 days from the start some 35 metamorphosed fish were transferred to a separate tank. These fish have since continued to feed and grow on the same diet. (Authors)

17774. Tsai, Chu-fa, and Edward C. Raney (Nat. Resources Inst., Univ. of Maryland, College Park, Maryland). 1974. SYSTEMATICS OF THE BANDED DARTER, Etheostoma zonale (PISCES: PERCIDAE). Copeia No. 1, pp. 1-24.

Etheostoma zonale is redescribed and variation patterns are analyzed. Geographical variation indicates the existence of two subspecies, Etheostoma zonale zonale (Cope) and Etheostoma zonale lynceum (Jordan). The former is found in the Mississippi River drainages above the Fall Line, western drainages of Lake Michigan and headwaters of the Savannah River on the Atlantic slope. The latter occurs in eastern tributaries of the lower Mississippi River, below the Fall Line, and in eastern Gulf slope drainages in Mississippi and Louisiana. The geographical origin of the species and its dispersion routes are postulated. (Authors)

17775. Steigenberger, Lance W., and P. A. Larkin (Inst. of Animal Resource Ecol. and Dept. of Zool., Univ. of Brit. Columbia, Vancouver, B.C., Canada). 1974. FEEDING ACTIVITY AND RATES OF DIGESTION OF NORTHERN SQUAWFISH (Ptychocheilus oregonensis). J. Fish. Res. Board Can., 31(4): 411-420.

Trapnet catches of northern squawfish (Ptychocheilus oregonensis) at Griffen Cultus lakes, British Columbia, indicated peak activity and feeding in the twilight and dark hours. At Griffen Lake, squawfish force-fed 2.0 g of redside shiner (Richardsonius balteatus), and held at 17-20 C, digested at a rate of roughly 14%/h. At Cultus Lake, squawfish trapped during the peak of feeding activity, and held at 10-12 C, were sacrificed at 6-h intervals, and showed a digestion rate of sockeye salmon (Oncorhynchus nerka) smolts of 14%/h. Larger fish ate larger volumes of food. Regression techniques are not completely adequate for describing the course of digestion, which apparently involves an initial period of retention of food, followed by a fairly rapid evacuation of most of the ingested material. Most fish cleared their stomach contents in 24 h, and one half had done so between 12 and 18 h. In the laboratory, squawfish force-fed rainbow trout (Salmo gairdneri) had rates of digestion which increased with temperature, from about 5%/h at 4-6 C, to 40-50%/h at 24 C. Larger weights of food were digested at slower rates, but there were no consistent differences in rate of digestion by different sizes of squawfish. The rates of digestion are higher than those reported for various predatory European fishes. (Authors)

17776. Larson, Gary Lee (Coll. of Fish., Univ. of Wash., Seattle, Washington 98195). 1973. LIVER WEIGHT OF BROOK TROUT IN A HIGH-MOUNTAIN LAKE IN WASHINGTON STATE. Prog. Fish-Cult., 35(4): 234-236.

Liver weights (expressed as the percent of body weight minus gonad weight in grams) of most male and female brook trout (Salvelinus fontinalis) were highest shortly after the winter lake cover, that had capped Pratt Lake for many months and disappeared in July. In later weeks (August 9 - September 13) the trend was for liver weights to decrease; in September, however, males and females with the most advanced gonad maturation had liver weights similar to those found in July. (Auth.)

17777. Dorson, Michel, and Pierre de Kinkelin (Inst. Nat. Rec. Agron., Lab. d'Ichthyopath., Thiverval-Grignon, France). 1974. INFECTIOUS PANCREATIC NECROSIS OF SALMONIDS: EXISTENCE IN THE SERUM OF UNDAMAGED TROUT OF A 6S MOLECULE SPECIFICALLY NEUTRALIZING THE VIRUS. (Necrose Pancreatique Infectieuse des Salmonides: existence dans le serum de truites indemnes d'une molecule 6S neutralisant specifiquement le virus). C.R. Acad. Sc. Paris 278 (Serie D): 785-788; Fish Health News, 3(2): p. 4.

The sera of rainbow trout taken from an I.P.N. free trout farm neutralized the virus responsible for this disease. The neutralization was specific for the Sp serotype (neutralization titer against Sp serotype: 5,500, against Ab serotype 1,400, against ATCC VR 299 less than 20), and was associated in every case with molecules having sedimentation coefficients of 6S, and occasionally also with I6S Igm. (Authors)

17778. Charles, James R., and William N. McLemore. 1973. RESERVOIR DISCHARGE INVESTIGATION AT BARREN RIVER AND NOLIN RIVER RESERVOIRS. Kentucky Fisheries Bulletin No. 59, 3 parts: Part 1 - 94 p.; Part 2 - 127 p.; Part 3 - 156 p.

The effects of epilimnial versus hypolimnial discharge regimens on water quality, benthos, fish populations, and sport fisheries of 2 south-central Kentucky flood control reservoirs, and their respective tailwaters, were compared over a 4-year period (1968-1971). Water was discharged from the epilimnion at Nolin River Reservoir (5,800 acres) during 1968 and 1969, while 25 air miles to the south, at Barren River Reservoir (10,000 acres), water was withdrawn from the hypolimnion. Discharge regimens were reversed during 1970 and 1971 at both of these Corps of Engineers' impoundments. The precise relationships between discharge outlet location and dissolved oxygen distribution at both BRR and NRR were obscured by hydrological events and inadequate epilimnial discharge facilities at each reservoir. Substantial supplemental discharge was required from the flood gates (hypolimnion) to maintain seasonal pool elevations during 1 year of the 2-year cycle scheduled for epilimnial discharge at both reservoirs. Hydrological factors, such as rainfall amounts and patterns of inflow, appeared to influence dissolved oxygen content and distribution more than did discharge location. High inflows early in the year (high-oxygen-demand water) resulted in reduced dissolved oxygen content later in the summer when stratification became more pronounced, regardless of discharge regimen. High summer inflows during hypolimnial discharge years resulted in improved dissolved oxygen distribution to greater depths in the reservoirs since the resultant evacuation was of oxygen-deficient hypolimnetic waters. Dissolved oxygen distribution was more restricted during those years with low summer reservoir inflow. Conversely, during expilimnial discharge regimens, dissolved oxygen was found deeper during years of low summer inflow (more oxygen-rich surface waters retained) than in years with high summer inflow. Taken collectively, these findings tend to indicate that hypolimnial discharge regimens augment the vertical distribution of dissolved oxygen in reservoirs that are subject to frequent and extensive summer precipitation. Dipterans and Oligochaeta were the most abundant macroinvertebrates in BRR. Benthic organisms generally were most abundant at the 15-foot depths and least abundant at the 40-foot depths. They were more abundant during the third period (late summer) than during the first period (early summer). The upper- and mid-reservoir stations were more productive than the lower main pool. Benthos findings at NRR paralleled those at BRR as regards abundance, species composition, and distribution. Reservoir discharge regimen had no discernible effect on the abundance or distribution of benthos in either BRR or NRR. No differences in either fish population composition or fish biomass attributable to discharge regimen were found at either BRR or NRR. In fact, both the highest and lowest total fish biomass values, obtained by cove sampling with rotenone, were recorded during the hypolimnial discharge years at BRR. At NRR, regardless of discharge regimen, the annual standing fish crop value consistently declined throughout the 4-year sampling period. Expansion of data resulting from weekly non-uniform probability creel surveys (March 1 - October 31) revealed no relationship between empirical creel survey statistics and discharge regimen at either BRR or NRR. Both the greatest total harvest (11.3 pounds per acre in 1971) and the least total harvest (7.5 pounds per acre in 1970) were recorded during years of hypolimnial discharge at NRR; intermediate values of 10.5 and 8.7 pounds per acre were harvested during 1968 and 1969 (epilimnial discharge). Total harvest at BRR ranged from a maximum of 12.0 pounds per acre in 1968, to a minimum of 7.3 in 1969, both epilimnial discharge years; the 1970 and 1971 harvests were 9.7 and 7.7 pounds per acre. Neither total harvest nor angler catch rate was directly related to the availability of harvestable-size fish in the population (determined by cove rotenone sampling); neither was appreciably affected by discharge regimen at either reservoir. Rainbow trout were stocked in the tailwaters of both BRR and NRR during hypolimnial-discharge years; this bonus species was avidly utilized, particularly in the NRR tailwater where it comprised 58% and 38% of the total catch in 1970 and 1971. It was recommended that: 1) since no adverse effects were found, choice of discharge regimen at any particular reservoir in Kentucky is an administrative decision, with each case being decided on its

individual merits (downstream water quality needs, two-story stocking plans, local angler preferences, etc.); 2) future reservoir discharge facilities be of sufficient capacity and of adequate design to provide maximum water quality control flexibility; 3) any future field investigations pertaining to reservoir discharge regimens be designed for a minimum of 5 years under each discharge regimen at each reservoir in order to preclude domination of the study design by prevailing weather conditions. (Authors)

17779. Peterson, S. A., W. L. Smith, K. W. Malueg (Nat. Eutroph. Res. Prog., Environ. Protection Agency, Corvallis, Oregon). 1974. HARVEST OF AQUATIC PLANTS: NUTRIENT REMOVAL IN AN ARTIFICIALLY ENRICHED LAKE. J. Water Pollut. Control Fed., 46(4): 697-707.

A study was made of the nutrient input and content of Lake Sallie, Minnesota. The prime nutrient source to the lake was pinpointed as the wastewater outfall from the city of Detroit Lakes. After determining the nutrient balance for the lake, a 3-month harvesting program was initiated. A reevaluation of the nutrient balance of Lake Sallie was made to determine the effects of aquatic plant harvesting. The study showed that a full-scale harvesting program was not sufficient to offset the high phosphorus loading in the lake. The harvesting program was able to remove only 1.37 percent of the total phosphorus input into the lake. (Authors)

17780. Hynes, H. B. N. (Dept. of Biol., Univ. of Waterloo, Waterloo, Ontario, Canada). 1974. FURTHER STUDIES ON THE DISTRIBUTION OF STREAM ANIMALS WITHIN THE SUBSTRATUM. Limnol. Oceanogr., 19(1): 92-99.

Samples collected with apparatus consisting of a series of pipes filled with gravel, driven into a streambed, and then opened for lateral colonization, confirm that invertebrates occur deep in the substratum: between 16 and 18 animals were found in each 600 ml from 13.5 cm down to at least 50 cm. Samplers buried in a trench dug into the true bank under the soil do not confirm studies suggesting that stream animals occur far from the water's edge under the banks: only a few truly aquatic animals were found 50 cm into the bank, although some occurred as far as 2 m from the water. (Auth.)

17781. Mooradian, Stephen R., and William F. Shepherd (N. Y. State Dept. of Environ. Conserv., New York). 1973. MANAGEMENT OF MUSKELLUNGE IN CHAUTAUQUA LAKE. N. Y. Fish Game J., 20(2): 152-157.

During the 1930's, the muskellunge fishery in Chautauqua Lake began to show a drastic decline due to many accountable factors. A decision was made to protect the remaining population with more restrictive regulations which commenced in 1941. Within a few years the spring netting catch of spawning muskellunge and the angler harvest began to increase. In addition to the more restrictive regulations, a second major management practice initiated in 1941 was maintenance stocking with fingerling muskellunge along with muskellunge fry. Studies conducted between 1961 and 1971 to evaluate the fingerling stocking program have illustrated the importance of the hatchery-stocked muskellunge to the lake fishery. The 1971 data indicate that over half of the muskellunge in the lake originate at the Prendergast Hatchery. Thus, both restrictive regulations and maintenance stocking with fingerlings are vital to this fishery. (Authors)

17782. Mudry, Dwight R., and Peter McCart (Dept. of Biol., Univ. of Calgary, Calgary, Alberta, Canada). 1974. Bulbodacnitis alpinus sp. nov. (NEMATODA: CUCULLANIDAE) FROM ARCTIC CHAR, Salvelinus alpinus L., WITH NOTES ON OTHER SPECIES OF Bulbodacnitis. Can. J. Zool., 52(4): 441-446.

Bulbodacnitis alpinus sp. nov. is described from Salvelinus alpinus L. from the North Slope of Yukon and Alaska. Bulbodacnitis alpinus was found to be present in both anadromous and freshwater resident stream populations but it is absent from lake populations of S. alpinus. Specimens of B. occidentalis Smedley, 1933, B. scotti Simon, 1935, B. ampullastoma Maggenti, 1971, and B. truttae (Fabricius, 1974) were examined and comparative measurements are presented. Bulbodacnitis scotti, B. ampullastoma, and B. occidentalis are considered synonyms of B. truttae. (Authors)

17783. Chernyshov, V. I., and M. M. Telitchenko (Biological and Pedological Faculty, Moscow Univ., Moscow, USSR). 1973. PHYSICO-CHEMICAL ASPECTS OF THE DEVELOPMENT OF PATHOLOGICAL PROCESSES IN Cyprinus carpio L. IN RESPONSE TO SHARP CHANGES OF TEMPERATURE AND OF OXYGEN CONTENT IN THE WATER AND TO INTOXICATION BY VARIOUS KINDS OF POISONS. J. Ichthyol., 13(1): 136-147.

Consideration is given to the physico-chemical mechanisms of adaptation of the carp (Cyprinus carpio L.) to a changing environment (the raising and lowering of temperature, a different degree of aeration, the presence of toxins of various origin and in different concentrations). It is concluded on the basis of changes in the variables investigated (the antioxidizing activity of tissue lipids, qualitative and quantitative changes in them, the accumulation of quinones and peroxides) that nonenzymatic processes of free radical oxidation play an active part in the formation of the nonspecific pathogenic background in the form of autotoxins (peroxides). It is assumed that the rate of free radical oxidation, which is the cause of the accumulation of autotoxins (peroxides), affects the resistivity of the organism in infectious diseases and the possibility of adapting to environmental changes.

17784. Judd, John B., and Stephen H. Taub. 1973. THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS. Ohio Bio. Surv. Biol. Notes No. 6, 51 pp. Ohio Bio. Surv., The Ohio State Univ., Columbus, Ohio 43210.

A historical survey was conducted of ecological conditions and the status of the largemouth bass, (Micropterus salmoides), population of Buckeye Lake, Ohio beginning with the conditions of the area prior to construction of the lake in 1826. An evaluation of the existing status of aquatic vegetation, limnological parameters, interspecific interaction of fish species, age and growth and parasite infections of the largemouth bass was carried out in 1970. Buckeye Lake was created by the impoundment of water in a large swamp area. The decrease in the extent and number of species of higher aquatic plants and the removal of stumps, logs and debris have reduced the capacity of the lake to support the large numbers of largemouth bass that were present in the late 1800's and early 1900's. The lake has become increasingly eutrophic and turbid due in part to increased wave action and increase in plankton. Although the population size of the largemouth bass has decreased, the growth rate has increased. Interspecific competition from other fishes does not noticeably affect growth or reproduction of the largemouth bass. A typical parasite fauna is supported by the largemouth bass. (Authors)

17785. Oviatt, Candace A., and Scott W. Nixon (Grad. School of Oceanogr., Univ. of Rhode Island, Kingston, R. I.). 1973. THE DEMERSAL FISH OF NARRAGANSETT BAY: AN ANALYSIS OF COMMUNITY STRUCTURE, DISTRIBUTION AND ABUNDANCE. Estuarine and Coastal Marine Science, 1(4): 361-378.

Monthly samples of demersal fish were collected from nine regular and 13 occasional stations in Narragansett Bay, Rhode Island throughout a year. While over 9000 individuals representing 99 species were taken, the 10 most abundant species made up 91% of the catch. Taxonomic composition and dominance of the fish community were generally similar to that reported for adjacent Block Island Sound and Long Island Sound, though diversity was slightly higher in the bay. Winter flounder, Pseudopleuronectes americanus was by far the most abundant species, and accounted for 36% of the total catch. Multiple regression analysis of fish numbers and biomass for total catch and for the dominant flounder indicated that of 14 environmental variables considered, only depth, sediment organic content, temperature and wind speed were significant in explaining distribution within the bay. No clear pattern of fish abundance was apparent, except for higher diversity near the mouth of the bay. The mean annual standing crop of 117 $\pm$ 151 fish/acre and 28.5 $\pm$ 16.0 lbs./acre (wet weight) was comparable to values reported for a variety of New England coastal and offshore areas. The total biomass of fish remained remarkably constant throughout the year when compared to adjacent coastal environments, while the abundance of particular species varied substantially with season. (Authors)

17786. Arthur, John W., Armond E. Lemke, Vincent R. Mattson, and Barbara J. Halligan (U.S. Environ Protection Agency, Nat. Water Qual. Lab., Duluth, Minn.) 1974. TOXICITY OF SODIUM NITRILOTRIACETATE (NTA) TO THE FATHEAD MINNOW AND AN AMPHIPOD IN SOFT WATER. Water Research, 8(3): 187-193.

Amphipods, Gammarus pseudolimnaeus Bousfield and fathead minnows, Pimephales promelas Rafinesque, were submitted to acute (96-h) and chronic (generation-cycle) bioassays with sodium nitrilotriacetate (NTA). All measurements are reported as Na_3NTA. The average 96-h TL50 values under flow-through conditions were 98 mg l^{-1} NTA for the amphipod and 114 mg l^{-1} for the fathead minnow. The acute toxicity of NTA was caused in part by the high pH resulting from the addition of large amounts of NTA (> 100 mg l^{-1}) to soft water. Controlling pH reduced the lethality of NTA by at least one-half to fathead minnow larvae. The chronic no-effect level of NTA to the amphipods was 19 mg l^{-1}; in fathead minnows, it exceeded the highest exposure level (> 54 mg l^{-1}). (Authors)

17787. Poston, Hugh A., and Thomas H. McCartney (Tunison Lab. of Fish Nutrition, U.S. Bur. of Sport Fish. & Wildl., Cortland, New York 13045). 1974. EFFECT OF DIETARY BIOTIN AND LIPID ON GROWTH, STAMINA, LIPID METABOLISM AND BIOTIN-CONTAINING ENZYMES IN BROOK TROUT (Salvelinus fontinalis). J. Nutr., 104(3): 315-322; NOAA Mar. Fish. Abstracts, 27(5): p. 19.

Earlier work has shown that the type and level of dietary fat can mask the effects of biotin deficiency in chicks. Various other workers have established that salmonids require biotin for normal appetite, growth, and dermal and muscle condition, and that rainbow trout evidenced no deficiency syndrome fed a diet containing 0.01 p/m biotin and 5% soybean oil. Information on the metabolic interrelationships between biotin deficiency and dietary fat are contradictory and unclear. The present study was designed to determine the effects of dietary biotin and fat on the growth, feed conversion, swimming stamina, carcass and liver levels, and liver fatty acid composition of juvenile brook trout. The authors also examined the activities of two biotin-containing liver enzymes, acetyl CoA carboxylase (ACC) and pyruvate carboxylase (PC) in the same four dietary groups (see below) of trout. It is noted that ACC is considered the initial and rate-limiting enzyme in fatty acid synthesis for nonaquatic animals and PC is involved in supplying four-carbon units for gluconeogenesis and in replenishing tricarboxylic acid cycle intermediates. Eight-month-old brook trout (initial mean body weight of 1.2 g) were reared for 20 weeks in circular tanks of 8.3° C well water at 7.6 liters/min flow. Two groups of trout were fed one of the following diets: (1) basal diet; (2) basal diet plus 6 p/m biotin (dry basis); (3) basal diet plus 9 g partially hydrogenated soybean oil in each 100 g of diet; and (4) basal diet plus biotin and partially hydrogenated soybean oil (complete diet). Growth of the trout was measured by weighing the fish biweekly. After the 20th week, the whole fish carcasses were analyzed for water, fat, ash, and protein. The livers were analyzed for total lipids, for fatty acid composition, and for ACC and PC enzyme activity. In addition, swimming stamina of the live brook trout under controlled water velocities was estimated. Simultaneous dietary fat and biotin deficiencies in brook trout suppressed weight gain, feed/gain efficiency, swimming stamina, and total liver lipids. Dietary fat alone reduced body water, increased body fat and ash, reversed the elevating effect of biotin plus fat on liver palmitic and stearic acids, and widened the 16:0 to 16:1, 18:0 to 18:1, 18:2 to 20:4 and 18:3 to 22:5 liver fatty acid ratios. Fat also accentuated the accumulation of liver oleic and linoleic acids caused by biotin deprivation and apparently prevented docosapentaenoic acid biosynthesis in biotin-deprived trout. Fish fed fat with no biotin had the least, and those fed biotin with no fat the most, liver ACC and PC activities. Those fed neither supplemental biotin nor fat and those fed both showed equal liver ACC activity. The results indicate that brook trout require biotin for lipogenesis, gluconeogenesis, normal feed consumption and conversion, and sustained swimming stamina. Furthermore, depression of liver ACC activity and elevated precursor/product liver polyunsaturated fatty acid ratios in biotin-deprived trout fed fat are indications that partially hydrogenated soybean oil obscured biotin deficiency symptoms in brook trout.

17788. Vestergaard Jorgensen, P. E. 1973. INACTIVATION OF IPN AND EGTVED VIRUS. Riv. It. Piscic. Ittiop., 8(4): 107-108; Fish Health News, 3(2): p. 7.

Several procedures that are practical for disinfection of hatcheries were tested for their effectiveness in destroying infectivity of Egtved and of IPN viruses. Infectivity of both viruses persisted for at least 3 weeks after drying at 4°C in the dark. Treatment at pH 2.5 for 60 min destroyed nearly all the infectivity of Egtved virus, but IPN lost very little infectivity as a result of the same treatment. In contrast, even 10 min at pH 12.2 inactivated most IPN virus, but Egtved virus was much more stable at that alkalinity. Exposure for only 5 min to 2% formalin inactivated virtually all infectivity of both viruses. The author's report is succinct and quantified data are given. -- Ken Wolf

17789. Glooschenko, W. A., J. E. Moore, M. Munawar, and R. A. Vollenweider (Dept. of the Environ., Great Lakes Biolimnol. Lab., Canada Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY. J. Fish. Res. Board Can., 31(3): 253-263.

Primary production values in Lake Ontario were low in winter, reached a maximum in midspring, declined during summer, and slightly increased in fall. Rate of increase of production for inshore waters (< 20 m depth) was greater especially in spring and early summer with a greater maximum reached earlier than in offshore waters. Assimilation numbers, mgC fixed/mg chlorophyll a per hour, in Lake Ontario were fairly constant over the lake with a yearly range of 1.2-1.6. Primary production showed a linear relationship to chlorophyll a concentration, as also occurred in Lake Erie. Lake Erie primary production varied in its three basins. Seasonally, in the Eastern Basin, production was highest in spring with a midsummer decline, and small peaks in fall. The Western Basin had a maximum in midsummer whereas the Central Basin had peaks in late summer and early fall. Assimilation numbers were highest in the Western Basin (up to 3.5 mgC/mg chlorophyll a per hour) and lowest in the mid-Central Basin and Eastern Basin with values of approximately 1.4 mgC/mg chlorophyll a per hour. A definite westerly increase of assimilation number was observed. Up to early summer, the two lakes were fairly equal in surface production but integral photosynthesis, mgC/m^2 per hour was higher in Lake Ontario than in Lake Erie. The same was valid in November and December. In summer, Lake Erie was higher in production on both a mgC/m^3 per hour and mgC/m^2 per hour basis. For the period, April-December, Lake Ontario's total estimated yield was 170 gC/m^2, whereas for Lake Erie values of 160, 210, and 310 gC/m^2 were found for the Eastern, Central, and Western basins, respectively. (Authors)

17790. Shcherbachev, Yu. N. (Inst. of Oceanology, USSR Acad. of Sciences (IOAN), Moscow, USSR). 1973. THE BIOLOGY AND DISTRIBUTION OF THE DOLPHINS (PISCES, CORYPHAENIDAE). J. Ichthyol., 13(2): 182-191.

A description is given of the distinguishing characters of juvenile and adult specimens of the two species of the dolphins: the common dolphin (Coryphaena hippurus L.) and the pompano dolphin (C. equisetis L.); maps are given showing their distribution in the seas and oceans; information on the reproduction, growth, feeding and behavior of members of these species is given and discussed.

17791. Page, Lawrence M. (Ill. Nat. Hist. Survey, Urbana, Illinois). 1974. THE SUBGENERA OF Percina (PERCIDAE: ETHEOSTOMATINI). Copeia No. 1, pp. 66-86.

Conclusions based on a program of numerical taxonomy utilizing 45 characters measured in 32 species of darters resulted in the transfer of Percina crassa and P. roanoka from the subgenus Ericosma to Alvordius, the reduction of Hypohomus to a monotypic subgenus, and the creation of a ninth subgenus (Odontopholis) to contain P. cymatotaenia and an undescribed species. Diagnoses for all nine subgenera of Percina and a phylogeny of the genus are given. (Auth.)

17792. Klontz, George W. 1973. SYLLABUS OF FISH HEALTH MANAGEMENT. I. FISH CULTURE METHODS. II. FISH DISEASE DIAGNOSIS. Texas A&M Univ. Sea Grant Program, College Station, Texas, 165 p.; Fish Health News, 3(2): p. 7.

Dr. Klontz is a very experienced fish health expert with a background in veterinary medicine, fish biology, fish culture and management. This is obvious for any one who examines this syllabus carefully. It begins with a presentation of his well-known equation $\frac{\text{Management}}{\text{(Fish:Water:Container) plus Nutrition}}$ = Money. This means that if one has a clear conception of the dependence of fishes on environment and nutrition one can profit from fish culture. This is not a textbook but a collection of a great deal of information presented in the form of tables, graphs, photographs and formulas. It is not for a beginner in fish culture, but for an experienced fish culturist and it contains a wealth of factual information. The pictorial presentation of all steps in fish autopsy is outstanding. There are lists of all types of fish diseases with most essential descriptions. Fish parasites are presented as line drawings but their arrangement is accidental. The bibliography is limited to one page list of recent textbooks and symposia in the English language. There are additional essential bibliographies following different sections. -- S. F. Snieszko

17793. Yamazaki, Fumio (Lab. of Genetic and Embryol., Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1974. ON THE SO-CALLED "COBALT" VARIANT OF RAINBOW TROUT. Bull. Jap. Soc. of Sci. Fish., 40(1): 17-25. In Japanese with English abstract and plates.

The "Cobalt" or blue colored variant of rainbow trout are rarely found at trout farms located throughout Japan. Histological studies were made on the ventral brain regions of six such fish. It was found that the fish were abnormal because of the absence of a pituitary gland. They were further characterized by the lack of yolk deposition in oocytes and suppression of spermatogenesis, deposition of fat on intestinal organs, remarkable changes in the liver cells, retardedness of growth and lack of black spots and parr marks on the body. Some of these changes have been found in hypophysectomized teleost fish of various species. The fact that this variant is able to live in fresh water for at least five years, that interrenal tissues and thyroid glands are histologically normal, and that growth and formation of circuli of scales occur normally, suggests that more detailed studies are required regarding the involvement of pituitary hormones in these biological phenomena. (Auth.)

17794. Brooks, R. R. (Dept. of Chem. and Biochem., Massey Univ., Palmerston North, New Zealand). 1973. INSTRUMENTAL PARAMETERS FOR DETERMINATION OF MERCURY BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY. J. Assoc. Off. Anal. Chem., 56(6): 1306-1312; Selected Water Resources Abstracts, 7(8): p. 36, 1974.

Studies have been made on the instrumental parameters affecting the performance of the solution-reduction and the thermal-volatilization techniques of flameless atomic absorption for mercury. Optimum conditions established for the solution-reduction technique were: gas flow 5 L/min, stirring time 100 sec, and stirring rate at least 1250 rpm. Optimum conditions for the thermal-volatilization technique were: flow rate 1.5 L/min, heating time 20 sec. The reproducibility and time requirements of the two methods are compared, and guidelines are given on the application of the methods to various kinds of samples such as fish, rocks, sediments and soils.

17795. Tidd, Wilbur M., Richard A. Tubb, and Vivian Wright (Bur. Sport Fish. and Wildl., Ohio Coop. Fish. Unit, Ohio State Univ., Columbus, Ohio 43210). 1973. MODIFICATION OF Myxosoma cerebralis SPORE EXTRACTION TECHNIQUE. Prog. Fish-Cult., 35(4): 227-228.

If one wishes to quantify the entire spore content contained in a fish, it is necessary to include jaws, gill bars, spinal column, and the wash water from these in the extraction technique. Tables of data are presented showing that as much as 12% of spores of the head are contained in its wash water, and in some small fish 57% of the total spore count may be found in the spinal column. (Authors)

17796. Nikol'skiy, G. V., and V. P. Vasil'yev (Dept. of Ichthyol., Moscow Univ., Moscow, USSR). 1973. SOME FEATURES OF THE DISTRIBUTION OF CHROMOSOME NUMBERS IN FISH. J. Ichthyol., 13(1): 1-19.

An analysis is made of alteration of the chromosome number in fish in different geographic zones in the course of phylogeny and in different ecological groups. In general, the chromosome number is higher in fish from high latitudes than in fish from low latitudes. A reduction in the chromosome number is to be observed in the course of phylogeny within groups of teleost fish. Marine fish have on average fewer chromosomes than freshwater fish of the same geographic zone. Deepwater fish have fewer chromosomes than those which inhabit surface waters. The chromosome number is on average higher in diadromous fish which breed in freshwater than in those which breed in the sea. (Authors)

17797. Kanayama, Richard K., and Eric W. Onizuka. 1973. ARTIFICIAL REEFS IN HAWAII. Fish & Game Report No. 73-01, Div. of Fish & Game, Dept. of Land and Natural Resources, State of Hawaii, 23 p., illus.

The Division of Fish and Game of the Department of Land and Natural Resources, State of Hawaii initiated studies on the effects of artificial shelters on standing crops of fishes in 1957. Early studies with specially fabricated box-like concrete structures proved the usefulness of placing artificial shelters in areas lacking in natural shelters as a means of increasing the standing crop of fishes. Based on information gathered, a decision was made to construct artificial reefs on a larger scale and to utilize old car bodies, boat hulks, discarded household appliances and other miscellaneous materials. Subsequently, the Division has constructed four artificial reefs in areas where fish populations were low, due to the absence of natural shelter. The materials utilized for reef construction have been limited primarily to car bodies and damaged concrete pipes. Fish transects show that the artificial reefs effectively increase standing fish crops of previously unproductive areas. In this report, the artificial reef program of the Division of Fish and Game is described, and various aspects of the program are discussed and evaluated. (From introduction)

17798. Wilbur, Robert L. 1974. FLORIDA'S FRESH WATER FISH ATTRACTORS. Fish. Bull. No. 6 published by Florida Game & Fresh Water Fish Comm., 18 p.

Text includes: Fish attractors for warm water fishing ... Preliminary considerations... Attractor Descriptions - Brush attractors - Old Automobile tires - Rubble, rock and cement block - Vitrified clay pipes - Stake beds - Old car bodies - Hay, soybean and pelletized fish foods - Physical stimuli. Construction aids ... Cost analysis ... Comparative colonization of attractors ... Attractor placement ... Size, number and overharvest ... The ideal attractor .... Literature cited. (From table of contents)

17799. Gächter, R., R. A. Vollenweider, and W. A. Glooschenko (Dept. of the Environ., Canada Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. SEASONAL VARIATIONS OF TEMPERATURE AND NUTRIENTS IN THE SURFACE WATERS OF LAKES ONTARIO AND ERIE. J. Fish. Res. Board Can., 31(3): 275-290.

During 1970, temperature and nutrient distributions were measured in surface waters of lakes Ontario (12 cruises) and Erie (10 cruises). Nutrient patterns are compared and discussed in relation to temperature, primary production, and nutrient sources. In Lake Erie, due to the early onset of the phytoplankton spring bloom, nutrient concentration started to decrease much earlier than in Lake Ontario. During spring, patterns of nutrients, chlorophyll a, and primary production were influenced by the thermal bar in Lake Ontario. In Lake Erie the nutrient supply controlled such patterns. In Lake Erie inorganic nutrients were depleted lake-wide in summer; in Lake Ontario, nutrients were highest in regions where upwelling occurred or inputs were high. Due to the earlier onset of fall overturn in Lake Erie, the nutrient concentration started to increase earlier in the fall than in Lake Ontario. (Authors)

17800. Weagle, K. V., and R. A. Cameron. 1974. THE IMPACT OF THE STRUTT LAKE HYDRO PROJECT ON THE SNARE RIVER, N.W.T. Technical Report Series No. CEN/T-74-4, 32 p., Environ. Canada, Resource Mgmt Branch, Central Region.

A preliminary survey was made of the limnology and fisheries of the Snare River system from the Snare Falls Reservoir to the outlet of Strutt Lake in an attempt to predict the impact of a proposed hydro-electric scheme and to suggest mitigation measures. Little significant difference was found in either growth or condition when comparing the fish populations in the reservoir with those in Judd and Strutt Lakes. Differences were noted in species composition in the three lakes with the most abundant species in the lakes being lake whitefish and the most abundant species in the reservoir being longnose suckers. The three areas showed no significant differences in water chemistry. Once inundation occurs on Judd Lake the grayling populations will be greatly reduced and the longnose suckers will increase. The reduced flows in the Snare River below Judd Lake will reduce grayling in this area and may reduce the walleye populations in Strutt Lake by eliminating a major spawning area. The impact on the fish could be lessened by clearing in the proposed reservoir and providing flow in the present channel of the Snare River. (Authors)

17801. MacGregor, John S. (Southwest Fish. Center, NMFS, NOAA, P. O. Box 271, La Jolla, California 92037). 1974. CHANGES IN THE AMOUNT AND PROPORTIONS OF DDT AND ITS METABOLITES, DDE AND DDD, IN THE MARINE ENVIRONMENT OFF SOUTHERN CALIFORNIA, 1949-72. NOAA Fish. Bull., 72(2): 275-293.

This paper is about the contamination of the ocean and its biota off southern California by the pesticide, DDT. The accumulation of DDT and the changes in proportions of DDT and its metabolites in the ocean are described for the years 1949 to 1972 especially as they are reflected in the myctophid fish, Stenobrachius leucopsarus. This time period was characterized by continuous dumping of DDT wastes into the ocean by a large manufacturer of DDT and the cessation of this dumping in 1970. Aspects and implications of the pesticide pollution problem in the marine environment are discussed. (Auth.)

17802. Rogers, I. H. (Pacific Environ. Inst., Fish. Res. Board Can., West Vancouver, British Columbia, Canada). 1973. ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES. Pulp and Paper Magazine of Canada, 74(9): 111-116; Selected Water Resources Abstracts, 7(10): p. 43.

Toxic organic compounds were isolated from effluents of a bleached kraft mill by a new method, using Amberlite XAD-2 and DEAE-SEPHADEX A-25 ion-exchange resin columns from which organic solutes could be recovered without chemical changes. Bioassays on isolates of different history showed that the mortality of fish (sockeye salmon) was related to the resin acid content of effluents. Resin acids were toxic to young salmon at 2 ppm concentrations in static assays. Dehydroabietic acid was used as a standard reference compound, because of its superior chemical stability. Neutral fractions were nontoxic. Separation of a toxic fraction into its fatty acid and resin acid components indicated that both were toxic. The only chlorinated compound detected was trichloroveratrole (in minor yield). Heavy metals, such as Fe, Cu, Zn, and Cr, made negligible contributions to effluent toxicity.

17803. Dolinin, V. A. (Inst. of Physiol., Siberian Dept., USSR Acad. of Sciences, Novosibirsk, USSR). 1973. THEORETICAL ASPECTS OF THE EXPERIMENTAL STUDY OF RESPIRATORY METABOLISM IN FISHES. J. Ichthyol., 13(2): 245-253.

An attempt is made to codify information on the methods usually employed to study respiratory metabolism in fish; the limits of the applicability of these methods are determined. Attention is paid to some of the possible ways in which errors arise and measures are proposed for their reduction.

17804. Wagner, Harry H. (Oregon State Game Comm., Res. Div., Corvallis, Oregon). 1974. PHOTOPERIOD AND TEMPERATURE REGULATION OF SMOLTING IN STEELHEAD TROUT (Salmo gairdneri). Can. J. Zool., 52(2): 219-234.

Photoperiod was the main environmental factor controlling the onset of parr-smolt transformation in steelhead trout (Salmo gairdneri) as evidenced by subsequent changes in migratory behavior and coefficient of condition. Photoperiod appeared to act as a synchronizer of an endogenous rhythm because smolt-like fish were observed in the dark at constant temperature from December through July for fish $\geq$19 cm. Phase and frequency or phase adjustment only of the annual photoperiod cycle advanced or delayed smolting. Increasing day length was the major photoperiod constituent stimulatory to smolting whereas day length, as such, and accumulated hours of exposure were of lesser importance. Temperature did not appear to influence the onset of smolting but fish reared under a variable temperature cycle (6.9° to 18.6°C) generally migrated in larger numbers than did those reared under a constant temperature (12.3°C). When the seasonal temperature cycle was out of phase and behind the photoperiod cycle, the migratory period was extended. Conversely, when the temperature cycle was in advance of the photoperiod cycle, the migration period was shortened. (Auth.)

17805. Myrberg, Arthur A., Jr. (Univ. of Miami, Rosenstiel School of Mar. and Atmos. Sci., Miami, Florida). 1973. UNDERWATER TELEVISION - A TOOL FOR THE MARINE BIOLOGIST. Bull. Mar. Sci., 23(4): 824-836.

The difficulties encountered in carrying out any type of biological research directly in the ocean, are many and varied, indeed. To reduce this impact for one rather small but rapidly developing field - animal behavior - various tools now provide scientists the opportunity not only to observe, directly, phenomena of interest, but also to collect data over sufficient periods of time so that meaningful analyses are assured. One such tool, underwater television, has been a most important tool for various phases of behavioral research carried out at the Rosenstiel School of Marine and Atmospheric Science, University of Maimi. The rationale for its use in these programs is discussed, and a brief history of the evolution of this tool is provided. (Auth.)

17806. Yamamoto, T. (Dept. of Microbiol., Univ. of Alberta, Edmonton, Alberta, Canada). 1974. INFECTIOUS PANCREATIC NECROSIS VIRUS OCCURRENCE AT A HATCHERY IN ALBERTA. J. Fish. Res. Board Can., 31(4): 397-402.

The presence of infectious pancreatic necrosis (IPN) virus in brook (Salvelinus fontinalis) and rainbow (Salmo gairdneri) trout was identified and further investigated. A high incidence of virus was found by virological examination of kidney tissue from yearling and older trout. By comparison, brook trout had a much higher incidence of virus than rainbow trout. The virus was isolated most frequently from the kidneys of both species of trout. These findings indicate that the examinations of peritoneal washes and feces is not adequate for the detection of IPN carrier fish. (Auth.)

17807. Bond, W. A. 1974. THE COMMERCIAL FISHERY AT SANDY POINT, DISTRICT OF KEEWATIN, N.W.T. IN 1972. Data Report Series No. CEN/D-74-2 Environ. Canada, Resource Mgmt. Branch, Central Region, 16 p.

The Sandy Point commercial char fishery was sampled between August 29 and September 3, 1972. The average catch per unit of effort in the commercial fishery during the sampling period was 73.6 pounds (33.5 kg) of char per 50 yards of gill net per 24 hours. Male char had a mean fork length of 623.1 mm and a mean weight of 3132.8 g. Females averaged 608.5 mm in fork length and had a mean weight of 2869.7 g. The length-weight relationship for 102 Arctic char was: $\log_e W = 2.9152 \log_e L - 10.7635$. The female:male sex ratio was 1.27. Age determinations were performed on 96 char. Ages varied from 6 to 14 with 8 years old being the most common age. The mean age for the total sample was 8.9 years. Only 4 char out of 102 were judged to be sexually mature. The annual mortality rate was 36%. (Auth's summ.)

17808. Balon, Eugene K. (Dept. of Zool., Univ. of Guelph, Guelph, Ontario, Canada). 1974. DOMESTICATION OF THE CARP Cyprinus carpio L. Royal Ontario Museum, 100 Queen's Park, Toronto, Canada, Life Sciences Miscellaneous Publication, 37 p., illus. Price: $3.00.

Historical, zoogeographical, morphological, and physiological information were utilized in explaining the origins and history of domestication of the carp. The wild carp ancestor apparently originated in central Asia and spread naturally east into China and west as far as the Danube River. Evidence suggests that the Romans first cultured carp collected from the Danube, and the tradition of the piscinae was continued in monasteries throughout the Middle Ages. A starvation experiment demonstrated the hardiness of Danube wild carp and confirmed its suitability for domestication. Domestication of the carp in China was first independent of similar activities in Europe. The strong evidence pointing to rheophilic Danube wild carp as ancestral to modern domestic varieties suggests the importance of preserving this natural population for further use. (Auth.)

17809. Avise, John C., and Michael H. Smith (Savannah River Ecol. Lab., Aiken, South Carolina). 1974. BIOCHEMICAL GENETICS OF SUNFISH. I. GEOGRAPHIC VARIATION AND SUBSPECIFIC INTERGRADATION IN THE BLUEGILL, Lepomis macrochirus. Evolution, 28(1): 42-56.

Electrophoretic variation in proteins encoded by 15 genetic loci was analyzed in 2,415 bluegill (Lepomis macrochirus) representing 47 populations from 7 Southern states. Populations from the Florida peninsula and southeastern Georgia (L. m. purpurescens) differ in allelic composition at several loci from populations in central and western Georgia west to Texas (L. m. macrochirus), yielding coefficients of genetic similarity below the range generally found for continuously distributed conspecific populations in other vertebrates, but quite comparable to previous reports for various semispecies pairs. (From Authors' summ.)

17810. Cowell, Bruce C., and Brian S. Barnett (Dept. of Biol., Univ. of Southern Florida, Tampa, Florida). 1974. LIFE HISTORY OF THE TAILLIGHT SHINER, Notropis maculatus, IN CENTRAL FLORIDA. Amer. Midl. Nat., 91(2): 282-293.

Spawning of the taillight shiner in central Florida occurred from March to early October at water temperatures of 23-32 C; major periods of activity occurred in early spring, late spring and late summer. Fecundity of gravid females ranged from 72-408 ova per female and was positively correlated with total length. Fertilized eggs, held at 23 C in laboratory aquaria, were demersal and adhesive and hatched within 60-72 hours. Larval taillight shiners were pelagic. Growth and maturation of taillight shiners were rapid but varied depending upon time of hatching. The spring (1970) group of young-of-the-year reached 40.2 mm in total length by August, was reproductively mature, and subsequently spawned; the early summer group was approximately 39 mm by October but did not mature until the following April; and the late summer group grew throughout the winter but did not reach 40 mm or reproductive maturity until April. Post-spawning mortality of 1-year-old fish occurred over a 2- or 3-month period following the second spawning. Food consisted of algae, rotifers, copepods, cladocerans, ostracods and insects. However, utilization of food items varied with fish size. Larval shiners fed on rotifers, fish 20-40 mm long fed primarily on the cladoceran, Alonella globulosa, and larger fish (>40 mm) fed predominantly upon insect larvae. Electivity indices indicated that all sizes of taillight shiners were highly selective for large algal cells. Copepods were rejected by fish smaller than 40 mm, but selection increased in larger sizes. The cladoceran, A. globulosa, was consumed in about the same proportions as available, and Chironomidae and Heleidae larvae apparently were positively selected by larger fish. (Authors)

17811. Stewart, P. L., and J. S. Loch (Dept. of the Environ., Resource Mgmt. Branch, Fisheries Operations Directorate, Central Region, Winnipeg, Manitoba, Canada). 1973. A GUIDE FOR THE IDENTIFICATION OF TWO SUBFAMILIES OF LARVAL CHIRONOMIDAE: THE CHIRONOMINAE AND TANYPODINAE FOUND IN BENTHIC STUDIES IN THE WINNIPEG RIVER IN THE VICINITY OF PINE FALLS, MANITOBA IN 1971 AND 1972. Dept. of Environ. Tech. Report Series No. CEN/T-73-12, 46 p., illus.

17812. Maitland, Peter S. (The Inst. of Terres. Ecol., Edinburgh, Scotland). 1974. THE CONSERVATION OF FRESHWATER FISHES IN THE BRITISH ISLES. Biological Conservation, 6(1): 7-14.

This paper briefly reviews the status and distribution of populations of freshwater fishes in the British Isles and their worth as a resource. The total value of freshwater fishes to the community is far greater than is normally appreciated and includes, in addition to the economic sport and commercial fisheries, amenity, recreational, educational, and scientific, aspects as well as a potentially useful store of genetic material for the future. The main human pressures on existing fish stocks are discussed under the headings of fisheries, pollution, and land-use. The principal trends in the British Isles are away from natural and stable mixed fish populations towards artificially maintained unstable stocks of a few species of sporting or commercial value. In particular the rarer, more sensitive, fish stocks with poor powers of distribution are being eradicated and replaced by commoner, more robust forms with greater powers of distribution. The rarer species and genetic strains can only survive if constructive conservation projects are initiated expeditiously at a variety of levels. (Auth.)

17813. Whitaker, John O., and Dale C. Wallace (Dept. of Life Sciences, Indiana State Univ., Terre Haute, Indiana 47809). FISHES OF VIGO COUNTY, INDIANA. Proc. Ind. Acad. Sci., 82: 448-464.

The occurrence, distribution and habitats of the fishes of Vigo County were studied between November 1962 and November 1965. A total of 321 sites was visited of which 282 yielded fish. One hundred one species were taken and 25 of these are new records for Vigo County, 21 of which were previously reported. Additional new species are Notropis boops, Noturus gyrinus, N. nocturnus, and Etheostoma asprigene. Seven species previously reported were not taken in this study. No relationship was found between width of stream and the number of species present, except that streams less than 5 feet wide contained significantly fewer species than larger streams. There were significantly more species in deeper streams, and with increased number of bottom types per collecting area. Species most commonly found in highly polluted areas were Notropis atherinoides, Semotilus atromaculatus, Notropis spilopterus, N. blennius and Ericymba buccata. A dam built across Otter Creek in 1816 has greatly influenced fish populations. There were fewer species above the dam, due mostly to the lack of river species. (Authors)

17814. Evenhuis, Bernard Lee. 1973. INVENTORY AND CLASSIFICATION OF STREAMS IN THE BIG SANDY RIVER DRAINAGE. Dept. of Fish & Wildl. Resources, Kentucky Fish. Bull. No. 57, 42 p.

Streams of fishery importance in the Big Sandy River Drainage have been listed and classified on the basis of stream order. Some physical, chemical and biological characteristics of the streams are described as well as the general characteristics of the fishery. The Big Sandy Drainage includes a total of 4,290 square miles with approximately one half of this (2,284 square miles) being in Kentucky. Of this, a total of 766 linear miles has been found to be capable of supporting a stream fishery. Five streams (120 miles) are considered to be of outstanding quality, while approximately 191 miles (25%) have been degraded by pollution. Siltation is the primary form of pollution in the drainage. A total of 57 species representing 11 families have been identified from the Big Sandy River Drainage. The bluntnose minnow has been the most frequently collected and most abundant species found in the drainage. The most abundant game species has been the spotted bass with the longear sunfish being the most abundant pan fish. (Auth.)

17815. Schell, Stewart C. (Dept. of Biol. Sci., Univ. of Idaho, Moscow, Idaho). 1974. TWO NEW GENERA AND THREE NEW SPECIES OF ALLOCREADIID TREMATODES (DIGENEA: ALLOCREADIIDAE) FROM FRESHWATER FISHES. J. Parasitology, 60(2): 243-246.

Pseudurorchis catostomi sp. n., Nezpercella lewisi gen. et sp. n., and Multivitellina idahoensis gen. et sp. n. are described from several species of freshwater fishes collected in Idaho. The new genera are tentatively assigned to the subfamily Urorchiinae of the family Allocreadiidae. (Auth.)

17816. Schelske, C. L., and J. C. Roth (Great Lakes Res. Div., Mich. Univ., Ann Arbor, Michigan). 1973. LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE. Publication No. 17, 108 p.; Selected Water Resources Abstracts, 7(10): p. 66, 1974.

Extensive physical, chemical, and biological information was gathered with uniform methods from 87 stations in Lakes Michigan, Superior, Huron and Erie in the summer of 1970. Data include temperature, transparency, dissolved gasses, pH, alkalinity, major ions, nutrients, chlorophyll, carbon fixation by phytoplankton, zooplankton, and benthos. On the basis of limnological characteristics, the lakes are divided into ten distinct geographical zones and data on some of the parameters are compared for the ten zones. Temperature regimes vary greatly due to latitude, depth, and sampling time. In the central basin of Lake Erie, the mean surface temperature was compared with the mean concentration of dissolved oxygen. Calcium and alkalinity values are largely controlled by mineralogical characteristics of the drainage basins, whereas inputs of sulfate and chloride are largely urbanization and industrialization products. Absolute levels of silica and nitrate nitrogen in Lake Huron are controlled largely by nutrient concentrations in inputs from Lakes Michigan and Superior. Depletion of silica and nitrate in the epilimnion increases with increasing eutrophication. The lakes ranking in order of most oligotrophic to most eutrophic are Superior, Huron, Michigan, and Erie, with Saginaw Bay being as eutrophic as parts of Lake Erie.

17817. Carter, John C. H. (Dept. of Biol., Univ. of Waterloo, Waterloo, Ont., Canada). 1974. LIFE CYCLES OF THREE LIMNETIC COPEPODS IN A BEAVER POND. J. Fish. Res. Board Can., 31(4): 421-434.

In a small, shallow beaver pond near Georgian Bay, Ontario, life histories of each of the three limnetic copepods found were basically similar in the 3 yr 1970-72 although the patterns were occasionally obscured. Cyclops bicuspidatus thomasi presumably emerged from diapause at stage C 4 when the ice broke and went through one complete cycle to C 4 in 3-4 wk, reentering diapause in late spring. Mesocyclops edax emerged from diapause at C 4 slightly later in spring and underwent four complete cycles, reentering diapause in midautumn; normal time to complete a generation was about 1 mo. Diaptomus reighardi hatched from resting eggs in early May and produced four complete generations, the last maturing in early autumn; development of spring and summer generations required 1 mo and that of autumn generations about 1-1/2 mo. During 1972 lowered water levels resulted in increased heat content of the pond per unit volume and this was reflected in some acceleration of development rates of M. edax and D. reighardi. At most sampling times M. edax had about double the fecundity of D. reighardi indicating a correspondingly high mortality rate that might be the result of lower egg viability, cannibalism, or competition between nauplii of the two species. (Auth.)

17818. Kanwisher, John, Kenneth Lawson, and Gunnar Sundnes (Woods Hole Oceanogr. Inst., Woods Hole, Massachusetts 02543). 1974. ACOUSTIC TELEMETRY FROM FISH. NOAA Fish. Bull., 72(2): 251-255.

Methods are described for monitoring physiological parameters such as temperature and electrocardiogram from free swimming fish. Information is telemetered as sound radiating from an acoustic transmitter implanted on the fish. Limitations of the technique and construction details of representative devices are covered. Uses in both behavior and physiology are considered. (Authors)

17819. Lizenko, Ye. I., U. S. Sidorov, and O. I. Potapova (Inst. of Biol., Karelian Branch, USSR Acad. of Sci., Petrozavodsk, USSR). 1973. LIPID CONTENT IN THE GONADS OF THE CISCO (Coregonus albula L.) OF UROSOZERO (LAKE UROS). J. Ichthyol., 13(2): 253-261.

Data are given on total lipid content and also on the various lipids present in the eggs and milt of the cisco (Coregonus albula L.) of Urosozero. Consideration is given to the changes of total lipids and of the percentage content of phospholipids, cholesterol and its esters in the course of maturation of the gonads of males and females during the years 1968-1970.

17820. Bachmann, P. A., and W. Ahne. 1974. BIOLOGICAL PROPERTIES AND IDENTIFICATION OF THE AGENT CAUSING SWIM BLADDER INFLAMMATION IN CARP. Archiv. f. gesamte Virusforschung. (In press); Fish Health News, 3(2): p. 3.

The 10/3 isolate responsible for infectious swim bladder inflammation in carp was biologically characterized and compared with Rhabdovirus carpio. 10/3 virus replicated in a variety of cell cultures derived from fish, chicken and mammalian origin at 20°C. Its replication cycle in FHM cells lasted only 8-10 hours, and the virus was released slowly from the cells into the culture medium. Plaque morphology of 10/3 virus from Rhabdovirus carpio was similar, and cross-neutralization tests showed a close relationship between the two virus strains. 10/3 virus produced a disease in carp (Cyprinus carpio L.) and guppies (Lebistes reticulatus Bl.) similar to swim bladder inflammation after experimental infection. The clinical and pathological changes partly resembled the changes reported in carp after experimental infection with Rhabdovirus carpio. The importance of the common etiology of spring viremia caused by Rhabdovirus carpio and swim bladder inflammation is discussed, since up to now the diesase complexes and their etiology were considered to be separate entities. (Authors)

17821. Glooschenko, Walter A., James E. Moore, and Richard A. Vollenweider (Dept. of Environ., Fish. & Mar. Serv., Great Lakes Biolimnol. Lab., Canada Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. SPATIAL AND TEMPORAL DISTRIBUTION OF CHLOROPHYLL a AND PHEOPIGMENTS IN SURFACE WATERS OF LAKE ERIE. J. Fish. Res. Board Can., 31(3): 265-274.

Chlorophyll a analyses including pheopigments were made on water samples taken on 10 cruises on Lake Erie between April and December, 1970. The highest mean chlorophyll a values of approximately 11 μg/liter occurred in the mid-Western Basin, with a second maximum of 6 μg/liter off Erie, Pennsylvania. The southern shore is also characterized by high values of chlorophyll to the east of Cleveland, Ohio. The lowest yearly means were found in the eastern portion of the Central Basin and most of the Eastern Basin (approximately 3 μg/liter). Ratios of chlorophyll a between the Eastern, Central, and Western basins have a yearly mean of 1:1.4:2.8, respectively; with maximum differences in the summer, i.e. late August, the ratio was 1:1.5:7.2. Pheopigment concentration in the surface waters reached a maximum in late October corresponding to the fall overturn of the lake and subsequent resuspension of organic matter containing degradation products from the bottom of the lake. No significant correlation was found between zooplankton abundance and pheopigment concentration as in other water bodies studied. This may indicate that zooplankton food chains are primarily detrital in Lake Erie, with grazing of living phytoplankton playing a lesser role compared with more oligotrophic water bodies. (Authors)

17822. Knepp, G. L., and G. F. Arkin (Caterpilar Tractor Co., Peoria, Illinois 61611). 1973. AMMONIA TOXICITY LEVELS AND NITRATE TOLERANCE OF CHANNEL CATFISH. Prog. Fish-Cult., 35(4): 221-224.

The results of this investigation indicate that for channel catfish (Ictalurus punctatus) the LC_{100} value for total ammonia is 45.7 ppm and the LC_{50} value is 37.5 ppm. Observations of nitrate concentrations for channel catfish and largemouth bass (Micropterus salmoides) indicate tolerances as high as 400 ppm. (Authors)

17823. Shcherbina, M. A. (All-Union Pond Fish. Res. Inst. (VNIIPRKh), USSR). 1973. A STUDY OF DIGESTIVE PROCESSES IN THE CARP [Cyprinus carpio (L.)] COMMUNICATION I. ABSORPTION OF CRUDE FAT IN THE INTESTINE FROM SYNTHETIC DIETS. J. Ichthyol., 13(1): 104-111.

Experimental data are given which characterize the rate of resorption and excretion of crude fat in the alimentary canal and also its content in the chyme in carp fed on foods with a fat level of 0.8-5.0%.

17824. U.S. Department of the Interior (Fish & Wildl. Serv., Washington, D.C 20240). 1974. UNITED STATES LIST OF ENDANGERED FAUNA. U.S. Dept. of the Interior, 22 p.

17825. Spigarelli, S. A. (Dept. of Fish. & Wildl., Mich. State Univ., East Lansing, Michigan). 1971. ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (Micropterus salmoides). Proc. of 3rd Natl Symp. on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. pp. 328-333; Selected Water Resources Abstracts, 7(10): p. 69, 1974.

In order to better define the variable accumulations of Cs-137 fallout by the individuals of a fish population, the effects of selected ecological parameters were tested. Individual fish characteristics (sex and weight), monthly precipitation, and time of year were statistically analyzed for their influence on Cs-137 activities of largemouth bass collected from Wintergreen Lake, Kalamazoo County, Michigan. Monthly collections of bass were analyzed for Cs-137 activity. No significant difference in Cs-137 activity was detected between male and female bass of equal size. However, body weight was a significant factor; larger bass accumulated more Cs-137 and total Cs per unit weight than small bass. The plots of Cs-137 vs weight and total Cs vs weight were very similar and supported the specific activity concept. The relationship between weight and Cs-137 in bass was estimated to be curvilinear with positive slope up to approximately 1000 g and negative slope above 1100 g. Mean Cs-137 activities of bass collected monthly from May to October 1969 were significantly different. The maximum activities occurred during May, the minimum in August. No correlation was demonstrated between monthly precipitation levels and Cs-137 activities of bass.

17826. Potthoff, Thomas (Southeast Fish. Center, NMFS, NOAA, Miami, Florida 33149). 1974. OSTEOLOGICAL DEVELOPMENT AND VARIATION IN YOUNG TUNAS, GENUS Thunnus (PISCES, SCOMBRIDAE), FROM THE ATLANTIC OCEAN. NOAA Fish. Bull., 72(2): 563-588.

The development and variability of osteological and meristic features obtained from 427 juvenile Thunnus from 8 to 117 mm SL are described. The juveniles of T. atlanticus, T. thynnus, and T. alalunga can be identified. Thunnus obesus cannot be separated from T. albacares, but both are separable as the "Thunnus spp. complex" from the other three species. Identification methods are discussed with emphasis on the features of the axial skeleton, number of gillrakers over the ceratobranchial bone, pterygiophore pattern under the second dorsal fin, and the shape of the lateral line. (Auth.)

17827. Burns, N. M., and A. E. Pashley (Descriptive Limnology Section, Can. Centre for Inland Waters, Burlington, Ont. L7R 4A6, Canada). 1974. IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE ORGANIC CARBON IN LAKE ONTARIO. J. Fish. Res. Board Can., 31(3): 291-297.

Depth profiles of calm water settling velocities were measured in situ using specially constructed sampling bottles. Samples of water were taken at specific depths and the settling process commenced as soon as the samples were taken. Just before retrieval of the bottles, the samples were subdivided into upper and lower portions so that settling velocities could be calculated; these varied between -0.4 and +2.0 m day^{-1}. Net settling velocities measured at the top of the thermocline were used to estimate net settling fluxes from the epilimnion; these varied between -0.074 and +0.336 mmoles of phosphorus m^{-2} day^{-1}. Net settling flux can differ from sedimentation flux out of the epilimnion and the necessity for a clear distinction between these two values is emphasized. (Authors)

17828. Millard, Jack L., and Joseph P. McCraren (Warm Water Hatchery Biol. Center, Natl. Fish Hatchery, Tishomingo, Oklahoma 73460). 1973. USE OF SOFTENED WATER IN FISH CULTURE. Prog. Fish-Cult., 35(4): p. 190.

Deposition of carbonates and related maintenance problems were prevented in a variable temperature system by installing a commercial water softener on the heated water supply line. Fingerling and adult Tilapia mossambica and T. horonorum, fingerling goldfish (Carassius auratus), and channel catfish (Ictalurus punctatus) fry were maintained in the system for varying periods of time without incident. (Authors)

17829. Snieszko, S. F. (Eastern Fish Dis. Lab., Leetown, Rte. 1, Kearneysville, West Virginia). 1974. THE EFFECTS OF ENVIRONMENTAL STRESS ON OUTBREAKS OF INFECTIOUS DISEASES OF FISH. J. Fish Biol., 6(2): 197-208.

Infectious diseases of fishes occur when susceptible fishes are exposed to virulent pathogens under certain environmental stress conditions. Very little research has been carried out to show the effect of pollution on outbreaks of infectious diseases of fishes. Therefore, examples taken from the literature were selected and reviewed to show the coincidence of infectious diseases with stress caused by temperature, eutrophication, sewage, metabolic products of fishes, industrial pollution, and pesticides. (Auth.)

17830. Hoyt, Robert D., and Rory B. Flynn (Dept. of Fish & Wildl. Resources, Frankfort, Kentucky). 1974. COMMERCIAL FISHERY INVESTIGATIONS OF NOLIN AND ROUGH RIVER RESERVOIRS, KENTUCKY. Federal Aid Proj. 2-171-R, Division of Fisheries, Dept. of Fish & Wildl. Resources, Frankfort, Ky., 31 p.

The commercial fishery of Nolin and Rough River Reservoirs, Kentucky, was studied from January 1, 1972 to January 15, 1974. The number of fishermen working the study reservoirs decreased from 1972 to 1973. Fishermen were hesitant to cooperate in the early stages of the study, but by the end of the first year all licensees willingly cooperated. Two fishermen on Rough River were classed as regular or full-time fishermen in 1972. All other licensees in 1972 and all fishermen in 1973 were classed as part-time or occasional fishermen. The flathead catfish was the major species taken on both reservoirs. The smallmouth buffalo was common in Rough River, but completely absent in Nolin. Nolin Reservoir provided a greater commercial catch than Rough River Lake. Fishing success was greatest during March-April-May and October-November-December on both lakes. Commercial species were sold alive or dressed and utilized for personal use. The total value of all commercial species sold from both reservoirs was approximately $6000 in 1972 and $7500 in 1973. Trammel and gill nets were the only kinds of tackle used with the trammel predominating. Fishing effort was more continuous on Rough River than Nolin. More licensees fished Nolin than Rough River, but fished less tackle than the Rough River fishermen. A marked size selectivity was exhibited by the four-inch net mesh in catching only fish six pounds and greater. (Authors)

17831. Anonymous. 1973. LAKE RESTORATION. Compressed Air, 78(10): 11-16; Selected Water Resources Abstracts, 7(7): p. 53, 1974.

Various methods for alleviating eutrophication are described and details given of a community action leading toward preservation of New York lakes Waccabuc, Oscaleta, and Rippowam in cooperation with the Union Carbide Corporation. Three sampling stations were selected in each lake where oxygen, temperature, pH, alkalinity, turbidity, conductivity, and chlorophyll concentrations were measured. The profiles for all three lakes are characteristic of moderate levels of eutrophication. To oxygenate the hypolimnion, two aerators were installed by helicopter with air hoses connected to an on-shore air compressor discharging at 280 cfm. Two cylinders were put down some 45 feet near the deepest points in Lake Waccabuc, which was selected as the deepest of the lakes and the farthest downstream. The other two lakes are being used as 'controls' for eventual evaluation of the hypolimnetic aeration effects. Several thousand trout were stocked in Lake Waccabuc and their movements are being monitored. Benefits of the aeration may not be realized fully until 1974 because there is a time lag between the time the nutrients are regenerated in the hypolimnion and when they may become available to the algae during the maximum algal growth season.

17832. Bryant, Gary. 1974. A WHEELED DEVICE FOR SAMPLING THE BIOTA OF A CONCRETE-LINED CANAL. Calif. Fish and Game, 60(2): 97-99.

A wheeled device for sampling canal linings is illustrated and described. The device was developed during sampling work on the Delta-Mendota Canal.

17833. Fremling, Calvin R. (Dept. of Zool. & Entomol., Iowa State Univ., Ames, Iowa). 1960. BIOLOGY AND POSSIBLE CONTROL OF NUISANCE CADDISFLIES OF THE UPPER MISSISSIPPI RIVER. Iowa Univ. Res. Bull. 483, pp. 856-879.

17834. Pfuderer, Peter, Penney Williams, and A. A. Francis (Biol. Div., Oak Ridge Natl Lab., Oak Ridge, Tennessee). 1974. PARTIAL PURIFICATION OF THE CROWDING FACTOR FROM Carassius auratus AND Cyprinus carpio. J. Exp. Zool., 187(3): 375-382.

Crowding factors are those substances released by fish, which, under crowded conditions, inhibit both their growth and reproduction and depress their heart rate. We have partially purified the crowding factor from goldfish and carp by following a heart-rate-depression assay. The heart-rate-depression activity eluted with the diglyceride fraction from both silicic acid and Sephedex LH-20. A slightly different activity eluted with the free sterols. The peak activity associated with the diglycerides has a distinctive ultraviolet spectrum distinguishable from that of phthalic acid esters, which are also active in the assay system and are found in fish tissues and fish water. (Authors)

17835. Watson, N. H. F., and G. F. Carpenter (Dept. of the Environ., Fish., and Marine Serv., Great Lakes Biolimn. Lab., Can. Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ONTARIO. J. Fish. Res. Board Can., 31(3): 309-317.

Crustacean zooplankton concentrations (numbers per m^3) in the upper 50 m found in lakewide cruises during all or most of the seasons on lakes Ontario and Erie in 1970 and on Lake Huron in 1971 showed that the species of zooplankton crustaceans present in the three lakes were generally identical, although the times of maxima and relative species compositions differed. Calanoid copepods were most abundant and diverse in Lake Huron and western Lake Erie. Cyclopoids and cladocerans were most abundant in lakes Erie and Ontario and in the Saginaw Bay region of Lake Huron. The most abundant cyclopoid throughout the year in all three lakes was Diacyclops bicuspidatus thomasi; Tropocyclops prasinus and Acanthocyclops vernalis were abundant especially in lakes Ontario and Erie, respectively. Cladocerans were most numerous in lakes Erie and Ontario. Numbers of individuals fluctuated markedly through the season with maxima in the spring or summer months in all three lakes. Biomass values (ash-free dry weight) were highest in Lake Erie, especially the Western Basin, and in Saginaw Bay of Lake Huron. Although numbers of crustaceans/m^3 were much lower in Lake Huron than in Lake Ontario, net biomass values were similar. This was due to the greater size and average weight of crustaceans in Lake Huron samples. Inshore waters of Lakes Ontario and Huron and all three basins of Lake Erie were subject to greater fluctuations in concentrations of crustacean zooplankton and net biomass values than in the pelagic waters of Lakes Ontario and Huron. (Authors)

17836. Turdakov, A. F., and N. A. Aminova (Inst. of Biol., Kirgiz Acad. Sci., Frunze, USSR). 1973. A STUDY OF THE HEAT RESISTANCE OF THE SPERMATOZOA IN A NUMBER OF SPECIES OF TELEOST FISH. J. Ichthyol., 13(2): 198-204.

We determined the time for which the spermatozoa of 6 species of teleost fish remained motile in water and survival in the ejaculate at near-lethal temperatures. The level of heat resistance of the gametes was correlated with temperature conditions in the spawning period. The species investigated are arranged as follows in increasing order of the heat resistance of the spermatozoa: Issyk-Kul dace [Leuciscus schmidti (Herz.)], Issyk-Kul chebachok (May form) (Leuciscus bergi) < L. bergi (July form) < osman (Diptychus sp.) < pike-perch < pond carp < < grass carp. An increase in the heat resistance of the spermatozoa toward the end of the reproductive period was noted in L. bergi - a species with a protracted spawning period.

17837. Usui, Atsushi [Shizuoka Tansui Co. (Freshwater Fish Farming Co.) Shizuoka Prefecture, Japan]. Translated by Ichiro Hayashi, Tokai Regional Fisheries Research Laboratory, Tokyo, Japan. 1974. EEL CULTURE. Fishing News (Books) Ltd., 23 Rosemount Ave., West Byfleet, Surrey, England, illus., hard cover, £6.75.

17838. Eskildsen, U. K., and P. E. Vestergaard Jörgensen (The Danish Trout Res. Sta., Brönns, Denmark). 1973. ON THE POSSIBLE TRANSFER OF TROUT PATHOGENIC VIRUSES BY GULLS. Riv. It. Piscic. Ittiop., 8(4): 104-105; Fish Health News, 3(2): p. 5.

The authors administered culture-grown Egtved or IPN virus by oral intubation to hatching gulls, and assayed feces three times daily for a week thereafter. Egtved virus lost all infectivity during passage through the gulls. Although it was not quantified, some infectivity of IPN virus persisted during passage through the digestive tract of the birds. Positive evidence was found on the day of inoculation, and on the second, fifth, and seventh days post-inoculation. Serum neutralization was used to identify the fecal isolants as the specific strain that had been inoculated. -- Ken Wolf.

17839. Kaplan, Eugene H., J. R. Welker, and M. Gayle Kraus (Biol. Dept., Hofstra Univ., Hempstead, New York 11550). 1974. SOME EFFECTS OF DREDGING ON POPULATIONS OF MACROBENTHIC ORGANISMS. NOAA Fish. Bull., 72(2): 445-480.

Populations of epi- and infauna were studied from 10 mo before to 11 mo after a navigation channel was dredged through a small, shallow lagoon. A new sampler which penetrated 20-30 cm into the substratum was used. Current velocities and sedimentation patterns were changed due to an altered distribution of tidal currents, although flushing time was not appreciably altered. Values of certain particulate and dissolved nutrients changed after dredging, but no correlation was observed between animal populations and fluctuations in nutrients. Significant reductions in standing crop figures and species and specimen numbers occurred in both the bay and the dredged channel. Mercenaria mercenaria populations were reduced, but there was no evidence of mass mortality. Recovery of biomass in the channel was affected by sediment composition, but seasonal and sediment type variations were not significant in the bay as a whole. Goose Creek had a high predredging epi- and infaunal standing crop estimated at 36.83 g/m^2, but the number of organisms/m^2 was relatively low, indicating a preponderance of large forms. Productivity of Goose Creek was calculated at 89.87 $g/m^2/yr$ before dredging and 31.18 $g/m^2/yr$ after dredging. Productivity figures for the mixed peripheral marsh were calculated and the annual loss due to replacement of 10.87 ha of marsh by spoil areas was estimated at 49,487 kg. Altered land usage patterns tended to fix this loss on a permanent basis. The unusually profound effects of dredging reported for Goose Creek are attributed to its small size and shallowness. (Authors)

17840. McKim, James M., and Duane A. Benoit (U.S. Environ. Protection Agency, Natl. Water Qual. Lab., Duluth, Minnesota 55804). 1974. DURATION OF TOXICITY TESTS FOR ESTABLISHING "NO EFFECT" CONCENTRATIONS FOR COPPER WITH BROOK TROUT (Salvelinus fontinalis). J. Fish. Res. Board Can., 31(4): 449-452.

Exposure of brook trout (Salvelinus fontinalis) to sublethal concentrations of copper from yearlings through spawning to 3-mo juveniles was found sufficient to establish a "no effect" concentration. No adverse effects were found on survival, growth, or reproductive capacity of trout exposed in a second generation from egg through spawning to copper concentrations (about 9.4, 6.1, and 4.5 µg/liter) which had caused no adverse effects on their parents when exposed to similar concentrations from yearlings to spawning. Nor were any adverse effects found on survival or growth of their offspring when exposed to the same concentrations from hatching to age 90 days. Tissue residue analyses indicated no copper accumulation in gill, liver, kidney, or muscle of either first- or second-generation trout exposed to the various copper concentrations, and residues in unfertilized eggs from exposed females were similar to those in females not exposed to added copper. (Authors)

17841. Falk, M. R., and L. W. Dahlke. 1974. DATA ON THE LAKE AND ROUND WHITEFISH, LAKE CISCO, NORTHERN PIKE AND ARCTIC GRAYLING FROM GREAT BEAR LAKE, N.W.T., 1971-1973. Dept. of the Environ., Data Report Series No. CEN/D-74-1, 52 p. Fishery Mgmt Div., Resource Mgmt. Branch, 501 University Crescent, Winnipeg, Manitoba, Canada.

17842. Spall, Richard D. (Dept. of Physiol. Sci., Okla. State Univ., Stillwater, Oklahoma). 1974. A NEW MYXOSPORIDIAN IN RED AND GOLDEN SHINERS. J. Parasitology, 60(1): 169-171.

Myxosoma cyprini sp. n. is described in the gills of the red shiner, Notropis lutrensis, and golden shiner, Notemigonus crysoleucas, from Oklahoma. Cysts measuring 0.3 μ or less occur adjacent to capillary endothelial cells of secondary gill lamellae. Infected fish were collected in October 1971 and in June 1972. M. cyprini is disporoblastic and development is asynchronous. Mature spores are pyriform in front view and lenticular when viewed from the side. Fresh spores average 14.4 μ in length by 8.0 μ in width by 7.5 μ in thickness. Polar capsules are pyriform and 7.1 μ long by 3.0 μ wide. Approximately 9 windings of the polar filaments are seen inside each capsule. Extruded polar filaments are 100 to 110 μ long. Mucous envelopes are present. All of the 35 red shiners and 9 of 10 golden shiners contained M. cyprini. Host reactive cells do not appear at the locus of the parasite. (Auth.)

17843. Paperna, I., and D. E. Zwerner (Va. Inst. of Mar. Sci., Gloucester, Virginia). 1974. Kudoa cerebralis sp. n. (MYXOSPORIDEA, CHLOROMYXIDAE) FROM THE STRIPED BASS, Morone saxatilis (Walbaum). J. Protozool., 21(1): 15-19.

Kudoa cerebralis sp. n. is described from connective tissue of the nervous system in the striped bass, Morone saxatilis (Walbaum), from the southern Chesapeake Bay area. This is the first time the genus Kudoa has been found in association with the nervous system. The polar view mean diameter of the spores was 7.0 μm and the polar capsule mean length was 3.7 μm. (Authors' synopsis)

17844. van Banning, P. (Rijksinstitut voor Visserijonderzoek, Haringkade 1, IJmuiden, Netherlands). 1974. TWO REMARKABLE INFESTATIONS BY Lernaeocera spp. (COPEPODA PARASITICA). Journal du Conseil, 35(2): 205-206.

Two unusual infestations by Lernaeocera spp. are reported. One specimen of these blood-feeding parasites was found on the tail of the host, instead of the normal anchoring place in the gill chamber. Another showed the occurrence of Mytilus edulis L. as an epizootic organism. The anchoring of a Lernaeocera specimen to the tail of the host was observed on a 26 cm bib (Gadus luscus L.) caught in the Dutch coastal waters in November 1971. The other peculiarity observed was the occurrence of Mytilus edulis L. as an epizootic organism upon Lernaeocera branchialis L. The parasitic copepod was attached in the usual way to the gill chamber wall near the last gill arch of a 37 cm cod (Gadus morhua L.), also caught in the Dutch coastal waters in 1971.

17845. Schmidt, Gerald D., Paul D. Leiby, and Delane C. Kritsky (Dept. of Biol. Univ. of North Colorado, Greeley, Colorado). 1974. STUDIES ON HELMINTHS OF NORTH DAKOTA. VIII. NEMATODES FROM THE PADDLEFISH, Polyodon spathula (Walbaum), INCLUDING Thynnascaris dollfusi sp. nov. (NEMATODA: STOMACHIDAE). Can. J. Zool., 52(2): 261-263.

Thynnascaris dollfusi sp. nov. is described from the stomach of Polyodon spathula (Walbaum) in North Dakota and reported from this host in Alabama. It has a short intestinal cecum, a long ventricular appendix, spicules 1.07 to 1.45 mm long, and a vulva situated at the junction of the first and second thirds of the body. Female Camallanus sp. is also reported. (Authors)

17846. Pickering, Alan D. (Freshwater Biol. Assoc., Ferry House, Far Sawrey, Nr. Ambleside, Westmorland, England). 1974. THE DISTRIBUTION OF MUCOUS CELLS IN THE EPIDERMIS OF THE BROWN TROUT Salmo trutta (L.) AND THE CHAR Salvelinus alpinus (L.). J. Fish Biol., 6(2): 111-118.

The mucous of the trout and char was found to contain only one sialic acid, n-acetyl neuraminic acid (NANA). The concentration of NANA in the epidermis is directly proportional to the mucous cell concentration. In both species the highest concentration of mucous cells occurs on the anterior regions of the body and there are significantly fewer cells on the fins. These findings are discussed in the light of our knowledge of the functions of fish mucus. (Auth.)

17847. Priede, Imants G. (Dept. of Biol., Univ. of Stirling, Scotland). 1974. THE EFFECT OF SWIMMING ACTIVITY AND SECTION OF THE VAGUS NERVES ON HEART RATE IN RAINBOW TROUT. J. Exp. Biol., 60(2): 305-319.

Heart rates associated with swimming activity were measured in intact and vagotomized fish at 6.5 and 15°C. Low swimming speeds had no effect on heart rate but above a threshold speed it increased logarithmically with swimming speed up to the critical speed and maximum heart rate. Times for recovery after exercise increased rapidly above the critical speed. Bilaterally vagotomized fish at 6.5 C showed high resting heart rates and erratic cardiac responses to exercise. In bilaterally vagotomized fish at 15°C heart rates were normal except for a low maximum rate. It is concluded that the vagus nerve can function differently at different temperatures. (Auth. summ.)

17848. Bamford, O. S. (Zool. Dept., Univ. of Bristol, Bristol, England). 1974. OXYGEN RECEPTION IN THE RAINBOW TROUT (Salmo gairdneri). Comp. Biochem. Physiol., 48(1A): 69-76.

Experiments have been performed to locate the sites of oxygen sensitivity in trout. These experiments were: a) application of very rapid hypoxia; b) ventral aortic injection of hypoxic or hyperoxic blood; and c) extirpation of a possible receptor site, the pseudobranch. Rapidly applied hypoxia always caused an increase in amplitude of respiration with a response delay of about 5 sec, suggesting oxygen receptors exposed to blood rather than to water. An increase in heart rate followed a similar time course. Injection of hypoxic blood caused an increase in respiratory amplitude after a long response latency. Hyperoxic blood injection resulted in respiratory depression at about the same latency. It was concluded that blood oxygen receptors may be present in the brain, dorsal aorta or pseudobranch, but not the gills. The possibility that the pseudobranch is important in oxygen detection was tested by extirpation experiments. It is concluded that while the existence of peripheral oxygen receptors in the pharynx has not been disproved, the most important site of oxygen detection is the brain. (Auth.)

17849. Silbergeld, Ellen K. (Stroud Water Res. Center, Acad. of Nat. Sci. of Philadelphia, Avondale, Pennsylvania). 1974. BLOOD GLUCOSE: A SENSITIVE INDICATOR OF ENVIRONMENTAL STRESS IN FISH. Bull. Environ. Contamination and Toxicology, 11(1): 20-25.

The use of blood glucose measurements appears to be a sensitive, reliable indicator of environmental stress in fish. Exposure to low levels of dieldrin was shown to produce a significant response in blood glucose levels in the freshwater fish Etheostoma nigrum. Adaptation to the continuing presence of dieldrin was also demonstrated by measurements of blood glucose over 30 days. It may therefore be worthwhile to use blood glucose measurements to indicate the toxicological import of a substance added to the aquatic environment.

17850. Clayton, J. W., R. E. K. Harris, and D. N. Tretiak (Dept. of Environ., Fish. & Mar. Serv., Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada). 1974. GEOGRAPHICAL DISTRIBUTION OF ALLELES FOR SUPERNATANT MALATE DEHYDROGENSE IN WALLEYE (Stizostedion vitreum vitreum) POPULATIONS FROM WESTERN CANADA. J. Fish. Res. Board Can., 31(3): 342-345.

Walleye (Stizostedion vitreum vitreum) populations from western Canada contain three alleles for supernatant malate dehydrogenase (MDH). The protein subunits specified by these alleles produce isozymes that are readily distinguished by starch gel electrophoresis procedures. One of the MDH alleles (c^1) appears to reach a maximum frequency of about 0.6 in the walleye populations of Crean and Montreal lakes, two headwater lakes in central Saskatchewan. The frequency of this allele declines to about 0.1 in populations only a relatively short distance downstream from these headwater lakes. In most walleye populations tested the c^2 and c^3 alleles predominate at frequencies between 0.2 and 0.7, whereas c^1 is usually comparatively rare and occurs at a frequency of about 0.05. (Authors)

17851. Heckman, Richard A. (Dept. of Zool., Brigham Young Univ., Provo, Utah). 1974. PARASITES OF GOLDEN TROUT FROM CALIFORNIA. J. Parasit., 60(2): p. 363.

17852. Gibbs, Robert H., Jr., E. Jarosewich, and Herbert L. Windom (Dept. of Vert. Zool., Smithsonian Inst., Washington, D. C.). 1974. HEAVY METAL CONCENTRATIONS IN MUSEUM FISH SPECIMENS: EFFECTS OF PRESERVATIVES AND TIME. Science, 184(4135): 475-477.

Specimens of myctophid fish preserved for 1 month in formalin, ethyl alcohol, and isopropyl alcohol had higher concentrations of cadmium, copper, zinc, and sometimes lead, than did unpreserved frozen specimens. Properties of the preservatives and species differences in fish tissues both influence these metal concentrations. Maximum concentrations of some metals in preserved specimens appear to be attained within a month, while concentrations of others may continue to increase for years. Metal tags or other materials in the preservative may cause higher maximum concentrations than the preservatives alone. Comparisons of concentrations of metals between museum specimens and unpreserved (frozen) specimens must be considered unreliable until the changes resulting from preservation are understood. (Authors)

17853. Cearley, Jack E., and Ronald L. Coleman (Dept. of Environ. Health, Univ. of Okla. Health Sci. Center, Oklahoma City, Oklahoma). 1974. CADMIUM TOXICITY AND BIOCONCENTRATION IN LARGEMOUTH BASS AND BLUEGILL. Bull. Environmental Contamination and Toxicology, 11(2): 146-151.

The exposure of juvenile largemouth and bluegill to cadmium (0.0005 to 0.85 mg/liter) resulted in accumulation of this metal in concentrations greater than those of the water. The quantity of metal accumulated increased as the exposure concentration increased. An equilibrium developed between the concentrations of the metal in the water and in the tissues after approximately 2 months. Metal accumulations on the bass tissues were higher in the internal organs, followed by the gills and the remainder of the body. The bass were more sensitive to cadmium than the bluegill. Abnormal behavior patterns observed in both species suggested that the nervous system was the site of damage. (Authors' summ.)

17854. Ryck, Frank M., Jr. (Missouri Dept. of Conservation, Jefferson City, Missouri). 1974. MISSOURI STREAM POLLUTION SURVEY. Aquatic Series No. 8, Mo. Dept. of Conserv., Jefferson City, Missouri.

A statewide stream pollution survey was undertaken in 1967 by the Missouri Department of Conservation to provide information concerning stream conditions in Missouri. Only streams which were polluted are considered in this report, which covers conditions as they existed prior to September, 1971. Each county was surveyed with the assistance of the local conservation agent. Physical and chemical data were collected when a source of pollution was discovered. Aquatic organisms were sampled and their community structure in relation to pollution tolerance was determined. Streams were classified from Class 1, unpolluted, to Class 5, grossly polluted. Sections of streams that were seriously polluted (Classes 3, 4, and 5) were marked on a set of county maps and a master map of the state. As of September 1, 1971, Missouri had 799 miles of seriously polluted streams. This included 474 miles of Class 3 (moderately polluted), 147 miles of Class 4 (polluted), and 177 miles of Class 5 (grossly polluted) streams. Municipal wastes resulted in Class 3 pollution in 276 miles, Class 4 in 87 miles and Class 5 in 120 miles of stream. Mining wastes caused 123 miles of Class 3, 32 miles of Class 4, and 40 miles of Class 5 stream. Industrial wastes caused Class 3 pollution in 48 miles, Class 4 in 23, and Class 5 in 17 miles of stream. Agricultural pollutants seriously polluted 34 miles of stream. The major river systems in Missouri differed greatly in extent of pollution. The Elk-Spring River system had 40 miles of seriously polluted streams. Other totals included: White River system, 22 miles; Current-Eleven Point River system, no pollution; Gasconade River system, 4 miles; Osage River system, 51 miles; Blackwater River system, 37 miles; Upper Missouri River Tributary system, 151 miles; Grand-Chariton River system, 30 miles; Upper Mississippi River Tributary system, 7 miles; Salt River system, 74 miles; Cuivre River system, 11 miles; Lower Missouri River Tributary system, 158 miles; Meramec River system, 110 miles; Lower Mississippi River Tributary system, 30 miles; Black-St. Francis-Little River system, 76 miles. Municipal and industrial pollution in the St. Joseph-Kansas City area seriously affected an undetermined extent of the Missouri River. Similarly, an undetermined extent of the Mississippi River between the mouth of the Missouri and Ohio rivers was seriously affected. (Auth.)

17855. Szluha, A. T. (Dept. of Fish. & Wildl., Mich. State Univ., East Lansing, Michigan). 1972. POTAMOLOGICAL EFFECTS OF FISH HATCHERY DISCHARGE ON THE JORDAN RIVER, NORTHERN LOWER MICHIGAN. Available from NTIS as PB-227 459, $6.75 in paper copy, $1.45 microfiche, Ph. D. Thesis, 62 p; Selected Water Resources Abstracts, 7(8): p. 54, 1974.

The Bureau of Sport Fisheries and Wildlife is operating a lake trout (Salvelinus namaycush) hatchery in the Jordan River Valley utilizing two systems of springs for its water supply. Until the spring of 1972 the hatchery had been discharging its waste into the Jordan River without any formal treatment. During the winter of 1971 and 1972 two settling basins were built to remove 80-95% of settleable solids from the wastewater. In order to evaluate the ecological impacts of the hatchery wastes on the receiving stream, periphytic production rates and the oxygen balance were determined at locations above and below the outfalls during March through June 1971 and again in 1972. Periphytic production rates increased exponentially during the study periods. Mean productivity rates were seven times greater below the outfalls than at the control station above the discharge in 1971, and five times greater in 1972. Diurnal oxygen concentrations and temperature curves were obtained from sections above and below the hatchery discharges in order to estimate gross primary productions and community respirations. However, undeterminable ground and surface water accrual with oxygen concentrations usually lower than in the Jordan River distorted rates of changes of oxygen concentrations which were necessary to calculate gross primary production and community respiration. A primary production index was calculated from the diurnal oxygen curves. These data indicated that the oxygen balance in the Jordan River was not effected significantly by the hatchery effluent before or after installation of settling basins. (Auth.)

17856. Burnet, A. M. R., and Denise A. Wallace (Fish. Res. Div., Min. of Agric. and Fish., Wellington, New Zealand). 1973. THE RELATION BETWEEN PRIMARY PRODUCTIVITY, NUTRIENTS, AND THE TROUT ENVIRONMENT IN SOME NEW ZEALAND LAKES. Fish. Res. Div.,N. Z. Min. of Agric. & Fish., Fish. Res. Bull. No. 10, 28 p.

The trophic levels of 15 lakes in both islands of New Zealand were measured by the carbon 14 technique. The lakes ranged from an ultra-oligotrophic South Island high country lake (Lake Coleridge) to highly eutrophic lakes (Forsyth and Orakai). Relationships were established between the carbon assimilation rate (P_{max}) and the levels of (1) chlorophyll a, (2) soluble phosphorus, (3) reactive nitrate, (4) oxygen absorbed by phytoplankton respiration, and (5) the transparency of the water. Low oxygen levels and low transparency of the water are the two direct effects of eutrophication on a trout fishery and both are directly related to high P_{max} values. The correlation between P_{max} and the P and N levels enables us to relate them to the oxygen balance and to the transparency of the lake waters. For these reasons we consider the measurement of P_{max} by the C^{14} method to be one of the most useful measures of trophic state for the fisheries scientist. The results obtained in this study confirm the contention that amounts of inorganic phosphorus in excess of 0.01 ppm can lead to nuisance conditions. (Authors' summ.)

17857. Hassinger, Richard, and Donald Woods. 1974. EVALUATION OF FINTROL AS A FISH TOXICANT IN DEEP SOFTWATER LAKES. Minn. Dept. of Natural Resources, Div. of Fish & Wildl., Section of Fish., Investigational Report No. 325, completion report - Study 202, D-J Proj. F-26-R Minnesota, 13 p.

Successful rehabilitation of four, deep softwater trout lakes totaling 24,709 acre-feet of water was accomplished with Fintrol at a concentration of 1 ppb active ingredient. The toxicant was applied during the fall turnover to assure rapid mixing, and both sand grain and liquid formulations were used to achieve effective coverage. Treatment was lethal for all target species of fish but had no long-term effects on invertebrates. The total cost of treatment was $.77 per acre-foot. Survival and growth of the planted trout was excellent and a substantial sport fishery developed within two years following stocking. Rehabilitation of large, deep softwater lakes with Fintrol at fall turnover shows considerable promise as a fisheries management technique. (Authors)

17858. Falk, M. R., D. V. Gillman, and L. W. Dahlke (Fish. Mgmt. Div., Resource Mgmt Branch, Fish. Operations Directorate, Central Region, Winnipeg, Manitoba, Canada). 1974. COMPARISON OF MORTALITY BETWEEN BARBED AND BARBLESS HOOKED LAKE TROUT. Dept. of the Environ., Technical Report Series No.: CEN/T-74-1, 28 p.

An experiment was conducted at Taltheilei Narrows on Great Slave Lake, N.W.T. to assess hooking mortality among lure caught lake trout (Salvelinus namaycush) and to compare the effects of barbed and barbless treble hooks on the frequency of such mortalities. Mortality rates were 6.94 and 7.02 percent, respectively, from barbed and barbless hooks. This difference is not significant. More than 50 percent of fish captured were hooked in the upper and lower jaws. Less than 18 percent of fish captured were hooked in critical areas such as gill arches, gullet and eyes. The degree of hook damage and bleeding was generally light, with slightly less damage inflicted by barbless hooks. Severe bleeding from the gill arches was the primary cause of death for both barbed and barbless hooks. Hook placement was the principle factor causing death among lure caught lake trout and the use of barbless hooks will not necessarily reduce the overall mortality rate. Education of anglers to employ proper handling and hood removal techniques is proposed to keep hooking mortality to a minimum. (Authors)

17859. Stolte, Lawrence W. (N. H. Fish & Game Dept., Concord, New Hampshire 03301). 1973. DIFFERENCES IN SURVIVAL AND GROWTH OF MARKED AND UNMARKED COHO SALMON. Prog. Fish-Cult., 35(4): 229-230.

A study began in 1970 to determine the most suitable method of marking coho salmon (Oncorhynchus kisutch) being released into the coastal waters of New Hampshire. Smolts were marked by fin clipping and cold branding. Little difference in survival between marked and unmarked fish was found. Fish with three identifying marks appeared to have a reduced survival in comparison to fish with only one mark, but this difference was not statistically significant (0.5 level of significance, x^2 analysis). Little difference in size of individuals was recorded for the two experimental groups of fish. (Auth.)

17860. Purdom, C. E. (Fish. Lab., Lowestoft, England). 1974. FISH GENETICS IN AQUACULTURE. Fish Farming International, No. 2, pp. 117-121.

Genetic improvement in fish stocks is being sought in many ways, which can be listed under five sub-headings, some of which are interrelated: 1. Selection for desirable characteristics. 2. Development of inbred lines and selection for heterosis (hybrid vigour). 3. Evaluation and selection of interspecific or intergeneric hybrids. 4. Production of polyploids. 5. Control of sexual maturation or spawning. There are many ways in which conventional genetic improvement can be applied to farm fish and there are also several unique ways. In most cases these techniques are suitable for large or highly organised ventures. Their application is still dependent on future research and development but they could add impetus to what is already a rapidly growing area of food production.

17861. Zaika, V. Ye., and N. A. Ostrovskaya (Inst. of the Biol. of the Southern Seas, Ukrainian Acad. of Sci., (InBYuM), Sevastopol', USSR). 1973. INDICATORS OF THE AVAILABILITY OF FOOD TO FISH LARVAE 2. THE PERCENTAGE OF FEEDING CONSUMERS IN AN UNSTEADY FEEDING REGIME. THE AVERAGE TIME TAKEN TO SEEK OUT FOOD. J. Ichthyol., 13(1): 120-128.

Mathematical analysis of the indicator k, which reflects the proportion of individuals with food in the intestine after the nightly interruption in the feeding of fish larvae, is continued in the article. The possibility of using the equations which are put forward for analysis of the connection between k and t (when p = const) and between k and p (when t = const) and also to calculate τ' - the average time taken to seek out food is illustrated from actual information on the feeding of anchovy, herring and smelt larvae. General recommendations are made on use of the indicator k in study of the availability of food to fish and criticisms are made of the opinion of some ichthyologists that the feeding of Black Sea anchovy larvae is unrelated to the level of development of the food resources.

17862. Hoffman, Glenn L., and Fred P. Meyer (Eastern Fish Dis. Lab., Kearneysville, West Virginia). 1974. PARASITES OF FRESHWATER FISHES: A REVIEW OF THEIR CONTROL AND TREATMENT. T. F. H. Publications, Inc., Neptune City, New Jersey, 224 p.

This is the first review of the subject since 1928. Included are chapters on methods, conversion information, synopsis of the most widely used treatments, glossary, tables of methods reported with references, toxicity of parasiticides, and chemical synonyms. There are 390 references. Most unusual in parasitology is the inclusion of 105 color photographs of fish parasites. This book is intended for fish disease researchers and students, fish pathobiologists, fish culturists, and aquarists. -- G. L. Hoffman

17863. Armstrong, R. H. (Alaska Dept. of Fish and Game, Sport Fish Div., Juneau, Alaska 99801). 1974. MIGRATION OF ANADROMOUS DOLLY VARDEN (Salvelinus malma) IN SOUTHEASTERN ALASKA. J. Fish. Res. Board Can., 31(4): 435-444.

Of anadromous Dolly Varden (Salvelinus malma) migrating from the sea into Hood Bay Creek, Admiralty Island, and two other nonlake streams nearby, 61-87% were immature. Most of the immature fish left the streams within a few days of entering. Though nearly all smolts leaving the creek for 3 yr were marked, only 16-21% of the immature fish entering the stream bore these marks. Many of the fish marked in the creek as smolt were recovered entering the two other study streams as immature fish but not as spawners. Mature immigrants remained in the streams for several weeks until they had completed spawning in October and November. Most Dolly Varden that spawned in the creek had been marked there previously as smolt or as spawners, and none were observed to spawn in a stream other than the stream of origin. Smolts transplanted during their oceanward migration returned to spawn in the receiving stream, and adults displaced to saltwater sites on returning to the study streams returned to their home streams. Most fish from the creek spawned only once or twice. Males suffered a much higher spawning mortality than did females. This study and others on fish from lake-stream systems suggest that (1) anadromous Dolly Varden from nonlake streams in southeastern Alaska migrate both between nonlake streams and between nonlake streams and lake-stream systems; (2) during their first summer in the sea, fish from nonlake streams enter several streams while searching for one with a lake; (3) mature fish from nonlake streams leave their wintering area, usually a lake, and return to their home streams to spawn; and (4) mature fish from lake-stream systems go to the ocean to feed for several weeks to a few months and return to their home system to spawn and overwinter. (Auth.)

17864. Miller, John M., and Barbara Y. Sumida (Hawaii Inst. of Mar. Biol., Univ. of Hawaii, Coconut Island, P. O. Box 1346, Kaneohe, Hawaii 96744). 1974. DEVELOPMENT OF EGGS AND LARVAE OF Caranx mate (CARANGIDAE). NOAA Fish. Bull., 72(2): 497-514.

The development of eggs and larvae of omaka (Caranx mate) is described from approximately 2 h after fertilization to day 36 after hatching. The pelagic, spherical eggs (700-740 μ diameter) had a single oil droplet and hatched after about 26 h incubation at 24.5°C. The average growth rate in culture was 0.44 mm/day; feeding began four days after hatching. Fin development and ossification of omaka occurred at smaller sizes, but in the same sequence as jack mackerel (Trachurus symmetricus) off California. Of the body proportions measured, body depth was most useful in separating omaka from at least two other species of carangid larvae. The pigment pattern was also of diagnostic value. Reared larvae were indistinguishable from similar-sized field specimens. (Authors)

17865. FAO OF THE UN (Rome, Italy). 1973. CONTRIBUTION TO A WORLD-WIDE INVENTORY OF EXOTIC MARINE AND ANADROMOUS ORGANISMS. FAO Fisheries Tech. Paper No. 121, IN - Inventories, 49 p. (Distribution restricted).

17866. Lawler, Adrian R., Harold D. Howse, and David W. Cook (Sections of Parasitol., Microsc., and Microbiol., Gulf Coast Res. Lab., Ocean Springs, Mississippi). 1974. SILVER PERCH, Bairdiella chrysura: NEW HOST FOR LYMPHOCYSTIS. Copeia, No. 1, pp. 266-269.

17867. Hinton, D. E., M. W. Kendall, and J. C. Koenig (Water Resources Lab., Louisville Univ., Louisville, Kentucky). 1973. ENZYME AND TISSUE ALTERATIONS IN FISHES: A MEASURE OF WATER QUALITY. Univ. of Ky. Water. Res. Research Inst., Lexington, Research Report No. 68, 90 p.; Selected Water Resources Abstracts, 7(11): p. 54.

A variety of freshwater fishes were studied by light and electron microscopy, enzyme histochemical and biochemical methods. The objective was to determine normal structure and function in specific target organs and to compare these to altered states in aquatic pollution. The basic question, 'can fish tissues and enzymes serve as indicators of water quality,' was asked. Microscopic alteration in gill was indicative of copper toxicity at an exposure of 20 parts per billion. Gross and light microscopic alterations were indicative of a single exposure of channel catfish to 15 parts per million of methyl mercuric chloride (CH_3HgCl). Microscopic and correlated biochemical study fingerprinted the alterations in cells at an exposure of 0.67 parts per million CH_3HgCl. The developments of pathobiological autopsy techniques for the assessment of water quality is discussed.

17868. Hudson, Patrick L., and George A. Swanson (No. Central Reservoir Investigations, Bur. Sport Fish. & Wildl., Yankton, So. Dakota 57078). 1972. PRODUCTION AND STANDING CROP OF Hexagenia (EPHEMEREOPTERA) IN A LARGE RESERVOIR. Studies in Natural Sciences, 1(4): 36 p., published by The Nat. Sciences Res. Inst., Eastern New Mexico Univ., Portales, N.M., price $1.00.

Population dynamics of the mayflies Hexagenia limbata (Serville) and Hexagenia bilineata (Say), were studied in Lewis and Clark Lake from 1962 to 1969. Nymphs that hatched in June and July emerged as adults in 13-14 months (titled 1-year cycle) and nymphs hatched in late August or September emerged in 22 months (titled 2-year cycle). Although an estimated 79% of the newborn nymphs begin life in the 2-year cycle group, only 53% of the emergent adults were in this group because of mortality. Standing crop was highest in the shore area, although a major migration away from the shore occurred in the spring. This migration was most intense when the population density exceeded 100/m^2. Biomass ranged from 260 to 1070 mg/m^2 dry weight over the study period. Instantaneous emergence rates were higher than predatory mortality rates but were only operative from about 1 July to 15 September. Production was estimated by two methods from extensive sampling in 1964 on a 1256 hectare section of the reservoir. The growth method yielded 1.50 gm/m^2 dry weight and the Hamilton method, 1.67 gm/m^2. The turnover ratio of 2.81 calculated from these data multiplied by the standing crop over the rest of the reservoir resulted in an average annual production of 15.6 kg/hectare for the reservoir. The Hamilton method was applied to less extensive collections from 1964 to 1969. Maximum production occurred in 1966 at 2.41 gm/m^2. (Authors)

17869. Lackey, Robert T. (Dept. of Fish. & Wildl. Biol., Colorado State Univ., Fort Collins, Colorado 80521). 1972. A TECHNIQUE FOR ELIMINATING THERMAL STRATIFICATION IN LAKES. Water Resources Bull., 8(1): 46-49.

The design, installation, and operation of a compressed air system to eliminate thermal stratification in lakes is described. During a year-long field test on a 19 ha lake, this system effectively eliminated thermal stratification, increased dissolved oxygen, and kept part of the lake ice-free during winter. This system has the capability for use in larger reservoirs and, used for control or elimination of stratification in lakes, is a promising tool for alleviating problems caused by thermal stratification. (Auth.)

17870. Lui, Lee Chan (Malaysian Agric. Res. and Development Inst., Serdang, Malaysia). 1973. OBSERVATIONAL STUDY ON THE CULTURE OF Channa striata (Block). Extract from: Malaysian Agricultural Journal, 49(1): 7 p.

The feasibility of pond culture of Channa striata was investigated. Preliminary results show that this fish grew well when fed with trash fish and stocked with 'schooling' size fry. At a stocking rate of 3,000 per acre, a yield of 1,156 lb. per year and a food conversion coefficient of 12.2 is possible. Channa striata was observed to mature sexually and commenced spawning when only six months old. (Auth.)

17871. Brinkhurst, R. O. (Dept. of the Environ., Fish. and Mar. Serv., Biol. Sta., St. Andrews, New Brunswick, Canada). 1974. FACTORS MEDIATING INTERSPECIFIC AGGREGATION OF TUBIFICID OLIGOCHAETES. J. Fish. Res. Board Can., 31(4): 460-462.

Tubifex tubifex and Limnodrilus hoffmeisteri are both attracted to the feces of T. tubifex rather than to those of L. hoffmeisteri or a control sediment. This substantiates the hypothesis that lowered respiration and increased growth caused by mixing the two species could be due to an increase in time spent burrowing, rather than feeding, when isolated species are removed from their preferred food, the feces of another species of worm. It also helps explain the inter- and intraspecific clumping that characterizes their normal distribution. (Auth.)

17872. Fleener, George G., John L. Funk, and Perry E. Robinson (Mo. Dept. of Conservation, Fish and Game Research Center, Columbia, Missouri 65201). 1974. THE FISHERY OF BIG PINEY RIVER AND THE EFFECT OF STOCKING FINGERLING SMALLMOUTH BASS. Mo. Dept. Conservation Aquatic Series No. 9, 32 p.

The Big Piney River is a spring-fed, clear, hard-water stream. The fish population was sampled twice annually, spring and fall, at three stations for 8 years, 1951-1958, using an electric shocker. Forage fish were collected and reproductive success of game fish was monitored by midsummer seining. The harvest by fishermen was measured by means of a quantitative creel census. Sixty-nine species of fishes were collected including black redhorse, golden redhorse, smallmouth bass, longear sunfish, rock bass, hog suckers, green sunfish, gizzard shad, northern redhorse, carp and channel catfish. The Ozark minnow, bleeding shiner, northern studfish, stoneroller, and bluntnose minnow were the most important forage species. Averages for 8 years of pounds of fish taken per 10 hours electric shocking varied from 133 to 238. Drought had no discernable effect on catch rates. Average total lengths of smallmouth bass at the end of various years were: 1, 3.4 inches; 2, 6.3; 3, 8.5; 4, 10.6; 5, 12.8; 6, 14.9; 7, 16.2; 8, 17.1; and 9, 17.5. The fishery of the Big Piney was diversified with 69% of the anglers still fishing, 28% casting and 2% fishing set lines. Each year longear sunfish, rock bass, green sunfish and smallmouth bass made up about 90% of the catch. Fishing pressure varied from 52.5 to 111.3 hours per acre. The average annual yield of fish was 21.9 pounds per acre of which 4.2 pounds per acre was smallmouth bass. Most smallmouth bass were caught before they had completed their fourth year of life and less than 5% were more than 5 years old. There appeared to be a direct correlation between the number of young bass surviving the first summer and the number of fish the year class contributed to the creel. Over 92,000 marked fingerling smallmouth bass were stocked 1952-1955. An estimated 63,600 smallmouth bass were caught between 1953, when the first stocked fish entered the creel, and 1958 when no more marked fish were caught. Of that number, not more than 2,100 were stocked fish. This is a little more than 3% of all the bass caught and a little more than 2% return of stocked fish. (Authors)

17873. Thorpe, J. E. (Freshwater Fish. Lab., Pitlochry, Scotland). 1974. ESTIMATION OF THE NUMBER OF BROWN TROUT Salmo trutta (L.) IN LOCH LEVEN, KINROSS, SCOTLAND. J. Fish Biol., 6(2): 135-152.

The numbers of adult trout in Loch Leven were estimated in April each year 1968-71 by tagging fish caught by seine net, and estimating the proportion of the total stock tagged from examination of the angling catch during June-August. The vulnerability of tagged fish before June and after August was higher than that of untagged fish. Tag losses, estimated by double marking, were 2.15% over a whole angling season. The reporting rate of tag recaptures varied within and between years from 0.43 to 0.71. Differential mortality of tagged and untagged fish was unimportant, except in two subsidiary experiments when fish were tagged in June and August, when handling losses reached 2.7%. With adjustment for these measured errors, the stock of trout beginning their third or more years in the loch in April, fell from 126,665 in 1968 to 52,337 in 1971. (Auth.)

17874. Chapman, V. J., and B. J. Coffey (Univ. Auckland, New Zealand). 1971. EXPERIMENTS WITH GRASS CARP IN CONTROLLING EXOTIC MACROPHYTES IN NEW ZEALAND. Hidrobiologia No. 12, pp. 313-323; Weed Abstracts, 22(9): abstract No. 2080.

Lagarosiphon major, Ceratophyllum demersum, Egeria densa and Elodea canadensis are introduced exotic water weeds which have caused problems at times. Diquat is very effective in non-flowing water but decomposing weeds release nutrients back into the water. Brazilian snails (Marisa cornuarietis) breed freely in New Zealand and show promise for the control of these species but a very large population with its attendant problems would be needed to be effective. Grass carp (Ctenopharyngodon idella) of 0.5 kg average wt. showed a feeding preference in the order E. densa > L. major > C. demersum, while in further trials 2-year-old fish showed preferences for L. major > Vallisneria gigantea > Myriophyllum spp.; E. densa and Typha spp. were rejected. Aquatic weeds in the North Island accumulate arsenic and this may explain the variable palatability of some weeds to fish; the arsenic content of 1 fish fed on L. major was significant from the viewpoint of possible human consumption.

17875. Lackey, Robert T. (Fish. Sci., Va. Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1972. RESPONSE OF PHYSICAL AND CHEMICAL PARAMETERS TO ELIMINATING THERMAL STRATIFICATION IN A RESERVOIR. Water Resources Bull., 8(3): 589-599.

The effects of maintaining a 19 ha Colorado montane reservoir in a thermally destratified condition for one year were evaluated. Water temperatures were kept nearly vertically and horizontally isothermal throughout the year. The weighted mean temperature of the lake was 1-4°C colder in winter and 1-2°C warmer in summer than normal. Deep water in summer was up to 6°C warmer than typical hypolimnion temperatures, but summer surface temperature was unaltered. Without destratification dissolved oxygen depletion develops in summer and winter, but by eliminating stratification, oxygen was kept near saturation throughout the year. Alkalinity, pH, conductivity, and total residue were not significantly affected. Seston decreased which was probably due to declines in planktonic diatom populations. Increases in iron and manganese did not occur in deep water during destratification. Calcium concentrations increased slightly. Magnesium and most anions (chloride, nitrate-N, and silica) were not greatly altered, but sulfate concentration was reduced. Artificial destratification, as a reservoir management tool, will be very useful in altering chemical problems; particularly increasing oxygen and decreasing iron and manganese concentrations. (Auth.)

17876. Houde, E. D., and P. L. Fore (Rosenstiel School of Mar. and Atmospheric Sciences, Miami, Florida). 1973. GUIDE TO IDENTITY OF EGGS AND LARVAE OF SOME GULF OF MEXICO CLUPEID FISHES. Available from NTIS as COM-73-11418 $3.00 paper copy, $1.45 microfiche, Report No. NOAA-73 81602, 14 p.; Selected Water Resources Abstracts, 7(12): p. 19, 1974.

Descriptions of eggs and larvae of Harengula pensacolae, Brevoortia spp., Etrumeues teres, Opisthonema oglinum, and Sardinella spp. are given based on examination of specimens from the Gulf of Mexico, from laboratory rearing experiments, and from reports in the literature. A key to larvae is presented, primarily for identifying specimens longer than 15 mm standard length, but usually providing identification for much smaller specimens. A brief review of pertinent literature is included.

17877. Horne, Alexander J., and Charles R. Goldman (Div. of Sanitary Eng., Univ. of Calif., Berkeley, California). 1974. SUPPRESSION OF NITROGEN FIXATION BY BLUE-GREEN ALGAE IN A EUTROPHIC LAKE WITH TRACE ADDITIONS OF COPPER. Science, 183(4123): 409-411.

Nitrogen fixation by blue-green algae in highly eutrophic Clear Lake, California, was severely inhibited by trace amounts of copper. The chelation capacity of the lake is probably saturated by indigenous copper. Additions were only 1/200 of those normally used in algal control. Since nitrogen fixation provides half of the lake's annual nitrogen budget, economical eutrophication control appears possible. (Authors)

17878. Holmberg, B., N. Steffner, and K. M. Svensson. 1973. RAISING OF SALMONIDS IN FLOATING NET-CAGES IN THE COOLING WATER FROM A NUCLEAR POWER PLANT. Swedish Salmon Res. Inst. - Report LFI MEDD No. 7; Fish Health News, 3(2): p. 6.

Young of the year and yearling salmon and sea trout were reared in floating net cages in effluent cooling water from a nuclear reactor. Salinity was 7 parts per thousand. Temperature increase resulted in gas supersaturation of 115 to 120%, and a gas bubble disease occurred both in the young and the older fish. Serious mortality resulted in the young fish; few deaths occurred among the older fish. There were indications that deep cages (1.5 m) permitted the fish to go to greater depths and thereby to compensate for the supersaturation. -- Ken Wolf

17879. Shaposhnikova, G. Kh. (Zool. Inst., USSR Acad. of Sciences, Leningrad, USSR). 1973. SYSTEMATICS OF THE WHITEFISH Coregonus lavaretus (L.) OF LAKE LADOGA. J. Ichthyol., 13(1): 37-58.

Biometric and osteological data are taken as a basis for an examination of the systematic position of the different forms of the Lake Ladoga whitefish. The author follows the International Code of Zoological Nomenclature (1964, Russian translation 1966), according to which the subspecies should be taken as the lowest taxon when constructing a system within a species. The anatomy connected with feeding - the structure of the jaw bones and the number of gill rakers - are of the greatest importance for the intraspecies diagnosis of whitefish. Lake Ladoga is inhabited by lacustrine whitefish - the Ladoga whitefish, the Lakoga-Lake whitefish and the "valaamka", which are forms of the whitefish with few gill rakers Coregonus lavaretus lavaretus, and the black whitefish C. lavaretus mediospinatus. Lake-river whitefish are represented by C. lavaretus pallasi, which is confined to the rivers of the northern part of the lake, and the Volkhov whitefish C. lavaretus baeri, which is similar to the lacustrine grouping of whitefish with few gill rakers.

17880. Meehan, William R., Logan A. Norris, and Howard S. Sears (U.S. Forest Serv., Forestry Sci. Lab., Juneau, Alaska 99801). 1974. TOXICITY OF VARIOUS FORMULATIONS OF 2,4-D TO SALMONIDS IN SOUTHEAST ALASKA. J. Fish. Res. Board Can., 31(4): 480-485.

To determine acute toxicity to juvenile (1) pink, chum, coho, and sockeye salmon, (2) Dolly Varden char, and (3) rainbow trout, 2,4-D acid, butyl and isooctyl esters were tested in southeast Alaska. A comparable test was made in Oregon using coho salmon fingerlings. The mean percent mortality after 96 h and the highest concentration of herbicide that did not produce any mortality were determined for each formulation tested. At less than 50 ppm 2,4-D acid produced no mortality except in pink salmon fry. The butyl ester was most toxic causing nearly complete mortality in all species at concentrations > 1.0 ppm and the isooctyl ester least toxic of the ester formulations. Alaskan and Oregon coho fingerlings were similar in their responses to 2,4-D acid, butyl and isooctyl esters. The toxicities of three different formulations of isooctyl ester, a PGBE ester, and butyl ester to Alaskan coho fingerlings were also determined. There were few or no differences in toxicity among isooctyl ester formulations. The butyl and PGBE esters were similar in toxicity. (Authors)

17881. Thorpe, J. E. (Freshwater Fish. Lab., Pitlochry, Scotland). 1974. THE MOVEMENTS OF BROWN TROUT, Salmo trutta (L.) IN LOCH LEVEN, KINROSS, SCOTLAND. J. Fish Biol., 6(2): 153-180.

Juvenile trout enter Loch Leven during autumn and winter from the nursery streams, spend their adolescent phase offshore until reaching a length of c. 30 cm, and then move to the littoral areas in early summer. There are two types of littoral area: 'favourable' areas from which movement of individual fish in the summer is very restricted, and 'unfavourable' areas used briefly in early summer from which movement away is pronounced. Trout are absent from the littoral areas in winter. In subsequent summers homing to previous feeding areas is characteristic of fish from 'favourable' areas, with a tendency for older fish to move to the south east area of the loch. Spawning runs occur simultaneously into the main inflows, chiefly between October and December. Emigration into the outflow occurs, but is probably unimportant.

17882. Smith, Bernard R., J. James Tibbles, and B. G. H. Johnson (U.S. Fish and Wildl. Serv., Marquette, Michigan 49855). CONTROL OF THE SEA LAMPREY (Petromyzon marinus) IN LAKE SUPERIOR, 1953-70. Great Lakes Fish. Comm., 1451 Green Rd, Ann Arbor, Mich. 48107 Technical Report No. 26, 60 p.

The sea lamprey (Petromyzon marinus) gained entrance into Lake Superior in the early 1940's, and began making drastic inroads on the fish stocks by the early 1950's. Serious efforts to control the parasite began in 1953 with the installation of electrical barriers in streams to block spawning runs. Control measures became much more effective after 1958, when a selective toxicant, the lampricide 3-trifluoromethyl-4-nitrophenol (TFM), was used to destroy larval lampreys in streams. A unique methodology was developed for stream treatments which included surveys to find sea lamprey larvae, bioassays to determine effective lampricide concentrations, analytical techniques to monitor concentrations of lampricide throughout the treatment, and feeder systems to apply the toxicant in controlled amounts. Evidence of successful control was indicated first by reduced sea lamprey spawning runs, as measured by the numbers of adults taken at electrical barriers. The runs declined in 1962 by about 86%; periodic re-treatments of lamprey-infested streams held the population at a low level in 1963-70. Other indicators of success were decreases in the incidence of sea lamprey wounds on lake trout (Salvelinus namaycush), in the numbers of sea lamprey larvae in streams, and in the number of streams regularly used by sea lampreys for spawning. Although sea lamprey control and heavy plantings of hatchery-reared stock had restored lake trout abundance to prelamprey levels in many areas by 1970, the trout had not yet become self-sustaining. Additional effort will be required to further reduce the effects of lamprey predation. (Authors)

17883. Allen, Kenneth O. (U. S. Fish & Wildl. Serv., Fish Farming Exp. Sta., Stuttgart, Arkansas 72160). 1973. EFFECT OF OVERHEAD COVER ON GROWTH AND SURVIVAL OF CHANNEL CATFISH IN CIRCULAR TANKS. Prog. Fish-Cult., 35(4): p. 213.

Six circular tanks were used to culture channel catfish (Ictalurus punctatus); two were uncovered, two had covers that shielded 40% of the surface area, and two were 90% shielded. The water source was alternated between well water and moderately turbid reservoir water. There were no significant differences in growth, feed conversion, or survival due to the presence or absence of cover while receiving either well or reservoir water. However, some behavioral differences were noted. Fish in the covered tanks remained nearer the surface and were less easily disturbed by human activities. Growth per day was almost twice as great during periods of reservoir water use as during periods when well water was used. The faster growth with reservoir water was believed to have been associated with warmer temperatures of the reservoir water. (Auth.)

17884. LaPerriere, J. D., and R. F. Carlson (Institute of Water Resources, Alaska Univ., College, Alaska). 1973. THERMAL TOLERANCES OF INTERIOR ALASKAN ARCTIC GRAYLING (Thymallus arcticus). Report No. IWR-46, 36 p., available from NTIS as PB-227 239 $3.25 in paper copy, $1.45 in microfiche; Selected Water Resources Abstracts, 7(8): p. 51, 1974.

Arctic grayling, Thymallus arcticus, captured from the Chena River in Interior Alaska or artificially propagated from the sex products of fish from this population were tested for tolerance to elevated water temperatures. Most tests were conducted in recirculating temperature-controlled tanks with a few conducted as standard static bioassays. Median tolerance limit ranges were delineated for sac fry, young-of-the-year, fish larger than 10 cm, and fish larger than 20 cm. There is some evidence that the least sensitive life cycle stage is the young-of-the-year which had a median tolerance limit above 24.5C after acclimatization of 8.5C plus or minus 1C. Equipment limitations did not allow acclimatization of all fish at the same temperature, however. Therefore, some changes in tolerance due to life cycle changes were somewhat masked by the effect of different acclimatization temperatures.

17885. Varanelli, Carole C., and James D. McCleave (Dept. of Zool., Univ. of Maine, Orono, Maine 04473). 1974. LOCOMOTOR ACTIVITY OF ATLANTIC SALMON PARR (Salmo salar L.) IN VARIOUS LIGHT CONDITIONS AND IN WEAK MAGNETIC FIELDS. Animal Behavior, 22(1): 178-186.

Locomotor activity studies in the laboratory under artificial light cycles coordinated with times of sunrise and sunset demonstrated that ten of sixteen Atlantic salmon parr were nocturnal, with an approximately twenty-four hour periodicity. The remaining six fish exhibited diurnal activity patterns or activity mainly after times of light change. Two fish immediately shifted their activity patterns to coordinate with a 6-hr shifted light cycle. Six fish retained no activity patterns in constant light and only two of eleven fish had weak activity patterns in constant darkness. Results suggest that Atlantic salmon parr are dependent on a light-dark cycle for timing their activity rhythms. Three of twelve salmon in an imposed magnetic field four times the strength of the horizontal vector of the ambient field, increased their activity level and changed activity patterns in the increased field. The remaining fish showed no distinct change in locomotor activity. (Authors)

17886. Stickney, Robert R., Gary L. Taylor, and Richard W. Heard III (Skidaway Inst. of Oceanog., P. O. Box 13687, Savannah, Georgia 31406). 1974. FOOD HABITS OF GEORGIA ESTUARINE FISHES I. FOUR SPECIES OF FLOUNDERS (PLEURONECTIFORMES: BOTHIDAE). NOAA Fish.Bull., 72(2): 515-525.

The food habits of four species of bothid flounders from Georgia coastal waters were examined by means of stomach content analyses. Ocellated flounders, Ancylopsetta quadrocellata (Gill); bay whiff, Citharichthys spilopterus (Gunther); and windowpane, Scophthalmus aquosus (Mitchill) fed heavily on the mysid shrimp, Neomysis americana, without regard to season of the year or location within the estuary. The food habits of both A. quadrocellata and C. spilopterus changed to some extent as the fish became larger. Organisms larger than N. americana dominated the stomach contents of A. quadrocellata larger than 150 mm standard length and C. spilopterus larger than 125 mm. S. aquosus, in the size range examined, fed almost exclusively on N. americana. Fringed flounder, Etropus crossotus (Jordan and Gilbert) primarily consumed the calanoid copepod, Pseudodiaptomus coronatus, during the spring, summer, and fall and diversified their food habits during the winter. P. coronatus dominated the stomach contents both in the rivers and sounds of Georgia estuarine waters and was the dominant organism in fishes of all sizes up to 100 mm when polychaete annelids became important. The food of E. crossotus did not appear to vary with time of day; however, E. crossotus did not actively feed at night. The difference in food habits between E. crossotus and the other three bothid species appears to be associated with the relative size of the mouth. (Authors)

17887. Carpenter, G. F., E. L. Mansey, and N. H. F. Watson (Dept. of Environ., Fish. and Mar. Serv., Great Lakes Biolomnol. Lab., Canada Centre for Inland Waters, Burlington, Ontario L7R 4A6). 1974. ABUNDANCE AND LIFE HISTORY OF Mysis relicta IN THE ST. LAWRENCE GREAT LAKES. J. Fish. Res. Board Can., 31(3): 319-325.

In sampling on lakes Ontario, Erie, and Superior during three cruises from spring to fall, and on Lake Huron during eight cruises, Mysis relicta was generally not taken or not abundant in waters less than 25 m in depth. Its abundance appeared to increase with depth at least up to 200 m. Populations appeared to be concentrated in waters 125-200 m deep during summer and more dispersed during spring and fall. Highest numbers were found in Lake Superior, followed by lakes Ontario and Huron. A small localized population was found in the deep eastern part of Lake Erie. Size-frequency distributions from the various cruises on lakes Superior, Huron, and Ontario indicated differences in life cycles of the mysid in the three lakes. In Lake Superior there was one major period of recruitment, from February to July, and the generation time appeared to be 2 yr. In lakes Huron and Ontario recruitment appeared to occur from February to August and to be separated into a winter and a summer period; each of the generations appeared to mature in 18 mo. (Authors)

17888. McAllister, P. E., J. L. Fryer, and K. S. Pilcher. 1974. AN ANTIGENIC COMPARISON BETWEEN INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS (OSV STRAIN) AND THE VIRUS OF HAEMORRHAGIC SEPTICAEMIA OF RAINBOW TROUT (Salmo gairdneri) (DENMARK STRAIN) BY CROSS NEUTRALIZATION. J. Wildlife Diseases, 10(2): 101-103.

The infectious hematopoietic necrosis virus (OSV strain) and the virus of haemorrhagic septicaemia of rainbow trout (Salmo gairdneri) (Denmark strain) were examined for possible antigenic relationship by plaque neutralization using homologous and heterologous antisera. No neutralization of either virus was observed on exposure to heterologous antiserum. This indicates that there is no antigenic relationship between these two viruses as determined by this method. (Authors)

17889. Stern, Michele S., and Daniel H. Stern (Univ. of Missouri-Kansas City, Kansas City, Missouri 64110). 1974. LIMNOLOGICAL STUDIES OF LAKE JACOMO, JACKSON COUNTY, MISSOURI. II. THE DYNAMICS OF THE MACROBENTHOS AND ITS RELATIONSHIP TO WATER QUALITY AND PLANKTON DISTRIBUTION IN LAKES JACOMO AND PRAIRIE LEE, WITH A NOTE ON THE SPORT FISHERY, 1971-1972. Missouri Water Res. Research Center - Columbia, Completion Report, 75 p.

The macrobenthos and its relationship to the plankton and water quality were studied for a year in two adjacent recreational reservoirs, Lakes Jacomo and Prairie Lee. These primary recreational waters for metropolitan Kansas City, with more than 2 million visits annually, have been culturally eutrophicated. Both lake shorelines are dissected, and the watershed and privately owned shoreline areas of Prairie Lee Lake provide nutrients that promote nuisance Cyanophyta blooms in both lakes. Nitrate nitrogen concentrations ranged from 0.05-0.50 ppm, while those for orthophosphate ranged from 0.04-0.25 ppm. There were 74 macrobenthic and 151 plankton taxa collected. Insects, primarily Diptera, dominated the macrobenthos in Lake Jacomo and 4,256/ft^2 in Prairie Lee Lake in December. Diptera comprised 59% of the total macrobenthos in Lake Jacomo, while molluscs, mostly Musculium truncatum, made up 76% of it in Prairie Lee Lake. Cyanophyta, particularly Aphanizomenon flos-aquae, dominated the plankton for the second successive year. The sport fishery in Lake Jacomo has been decreasingly dominated by bluegill. The mean catch per angler over a five-year period was 1.5 fishes, and the mean catch per hour was 0.58 fish. (Authors)

17890. Hackney, Peter A., and Charles K. Minns (Dept. of Zool., Univ. of Toronto, Toronto, Ontario, Canada). 1974. A COMPUTER MODEL OF BIOMASS DYNAMICS AND FOOD COMPETITION WITH IMPLICATIONS FOR ITS USE IN FISHERY MANAGEMENT. Trans. Amer. Fish. Soc., 103(2): 215-225.

A model useful for managing interacting fish species, based on concepts of food competition, is developed and tested. The model consists of differential equations. One, in the Pearl-Verhulst idiom, specifies organisms which can serve only as food resources for consumers of higher trophic status. A 'storage' equation describes ingestion and assimilation of food by a consumer. Another equation derived with the storage equation describes growth and attrition (i.e., metabolic and mortality costs) in terms of energy. Further, consumers may prey upon each other in addition to the resources and the equations are shown to be adequate for describing food webs. The model is essentially one of energy flow and deals with biomass, instead of numerical, dynamics. Coded in a computer language (PL/I), the model simulates competition and clarifies aspects of yield and harvest strategies in systems of interacting populations. The model is illustrated with hypothetical populations which have variable turnover rates and the Lake-Trout-Burbot system in Lake Opeongo, Ontario. (Authors)

17891. Mercer, K. M., and H. P. Murphy (Dept. of the Environ. of Canada, Fish. Serv., Resource Development Branch, St. John's, Newfoundland, Canada). 1973. A RAPID TECHNIQUE FOR HANDLING LIVE ADULTS OF ATLANTIC SALMON TO COLLECT BIOLOGICAL DATA. Prog. Fish-Cult., 35(4): p. 217.

17892. Cherry, Donald S., Kenneth L. Dickson, and John Cairns, Jr. (Biol. Dept. and Center for Environ. Studies, Va. Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1974. THE USE OF A MOBILE LABORATORY TO STUDY TEMPERATURE RESPONSE OF FISH. Presented at the 29th Purdue Industrial Conf., May 7-9, 1974--to be published in the Purdue Univ. Engineering Bulletin, 23 p.

The biological assessment of industrial waste discharges, under partly controlled conditions at the discharge site, is becoming an increasingly important activity in water quality control. The advantages of this approach are: 1) elimination of changes in waste or water quality due to shipment, 2) indigenous species are more readily available for use, 3) use of local water is facilitated, and 4) evaluation of dynamic conditions characteristic of that locale is much easier. The facility used in this study was an aquatic laboratory consisting of a modified 20 m by 4 m (65 ft. by 12 ft.) mobile home. The facility is suitable for a variety of water quality studies including the temperature responses reported here. The laboratory was equipped with two temperature controlled circulating water baths, a "preference" trough, an "avoidance" trough monitored by closed circuit television, several 188 l (50 gal.) aquaria equipped with immersion heaters, and two 1128 l (300 gal.) holding tanks which received river water from a 1/2 hp continuous-flow immersion pump. Information originating at the laboratory was relayed via direct data communication (i.e., telephone couplers) from a teletype monitor at the site through a distance of 61 km (38 mi.) to a computer in the biology department. This permitted immediate data analysis through the main 370 computer complex on campus to which the biology computer was linked. Temperature preference and avoidance trials were conducted with 16 fish species from six families ranging from salmonids to catfish. Fish were collected near the laboratory from heated and unheated areas near the junction of two rivers receiving thermal effluent from a fossil fuel power plant. Trials were conducted for fish acclimated at temperatures from 30 to 12°C (at 3°C decreasing increments). Preference temperature decreased for all species as acclimation temperature decreased. The maximum preferred by each species tested occurred after its highest acclimation temperature. Bass, catfish and sunfish preferred the warmest temperatures, followed by minnows, while trout preferred the lowest temperature. Species that were eurythermal, as determined by the difference between the upper and lower avoidance limits, were catfish and sunfish while salmonids were stenothermal. (Authors)

17893. Page, Lawrence M. (Natural History Survey Div., Urbana, Illinois). 1974. THE LIFE HISTORY OF THE SPOTTAIL DARTER, Etheostoma squamiceps, IN BIG CREEK, ILLINOIS, AND FERGUSON CREEK, KENTUCKY. Ill. Natural History Survey, Biological Notes No. 89, 20 p.

17894. Pagenkopf, Gordon K., Rosemarie C. Russo, and Robert V. Thurston (Fish. Bioassay Lab., Dept. of Chem., Montana State Univ., Bozeman, Montana 59715). 1974. EFFECT OF COMPLEXATION ON TOXICITY OF COPPER TO FISHES. J. Fish. Res. Board Can., 31(4): 462-465.

Copper (Cu) is highly complexed by carbonate and hydroxide ions in natural waters and this complexation determines the concentration of copper species in solution. Results of detailed equilibrium calculations on data from bioassays where alkalinity, pH, hardness, and total copper concentration are different indicate that copper(II) is the chemical species that is toxic to fishes and that alkalinity is the factor controlling copper(II) concentration. (Authors)

17895. Allen, John L., and Joe B. Sills (Fish Control Labs., Fish & Wildl. Serv., U. S. Dept. of the Interior, La Crosse, Wisconsin 54601). 1974. GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF 3-TRIFLUORMETHYL-4-NITROPHENOL RESIDUES IN FISH. J. Assoc. Off. Anal. Chem., 57(2): 387-388.

A procedure for the determination of 3-trifluormethyl-4-nitrophenol (TFM) in fish tissues is described. Homogenized tissues are extracted with hexane-ethyl ether; the extract is cleaned up by partitioning the TFM from the extracting solvent into 0.1N NaOH, acidifying the aqueous solution, and partitioning again with hexane-ethyl ether. The TFM is methylated with diazomethane and analyzed by gas-liquid chromatography, using electron capture detection. Recoveries ranged from 75 to 100% from fish muscles that were spiked with 0.01-2.00 μg TFM/g. (Authors)

17896. Adomaitis, V. A., J. A. Shoesmith, and G. A. Swanson (U.S. Fish and Wildlife Service, Northern Prairie Wildl. Res. Center, Jamestown, No. Dakota 58401). 1973. CHEMICAL STABILITY OF PRESERVED OLIGOTROPHIC WATER SAMPLES. Reprint from Proc. No. Dakota Acad. Sci., 26(2): 1-5.

Tests were conducted to determine whether changes that may occur in the chemical characteristics of stored oligotrophic waters collected on 15 sites in northeastern Minnesota were affected by chloroforming. Chloroform was added on site to one of each pair of samples to stabilize the organic content of the water by preventing biological decomposition. The samples were subsequently stored at 25°C, and pH and specific conductivity were measured at intervals for a period of 13 months at which time nine additional chemical parameters (total dissolved solids, total alkalinity, chloride, sulfate, silica, calcium, magnesium, sodium and potassium) were measured. pH increased and specific conductivity decreased. Average changes occurring in time from the original levels were not influenced by treatment, and first differed significantly ($P < 0.05$, paired t test) at 14 days for pH and 8.5 months for specific conductivity. Total dissolved solids and sulfate were significantly ($P < 0.01$ and < 0.05 respectively) larger in treated than untreated samples after 13 months storage while the reverse was true for calcium ($P < 0.05$). Total alkalinity, chloride, silica, and magnesium, however, did not differ significantly ($P > 0.05$). Sodium and potassium levels were too low to provide meaningful comparisons. It was concluded that chloroform may be advantageous in preserving oligotrophic waters with respect to total dissolved solids, sulfate and calcium. (Authors)

17897. Szluha, Adam T. (Illinois State Water Survey, Peoria, Illinois 61601). 1974. POTAMOLOGICAL EFFECTS OF FISH HATCHERY DISCHARGE. Trans. Amer. Fish. Soc., 103(2): 226-234.

The ecological impact of fish hatchery wastes on periphyton production rates and oxygen balance were determined in the Jordan River from March through June, 1971 and 1972. The hatchery, located in the Jordan Valley utilizes two systems of tributary springs for its water supply. Until spring 1972 the hatchery had been discharging its untreated wastes into the Jordan River but during winter, 1971 and 1972 two settling basins were built to remove 80-95% of settleable solids from the wastewater. The Jordan Valley National Fish Hatchery discharged the approximate equivalent of 898 kg of elemental phosphorus and 4,170 kg of elemental nitrogen between July 1970 and June 1971, and 998 kg of phosphorus and 4,604 kg of nitrogen between July 1971 and June 1972. These quantities comprised approximately 28% and 5% of the annual load of phosphorus and nitrogen, respectively, in the Jordan River at the vicinity of the hatchery. Periphyton production rates increased exponentially during the study periods. Mean production rates were seven times greater below the outfall than at the control station above the discharge in 1971, and five times greater in 1972. Although periphyton production rates were increased below the outfalls, oxygen balance was not affected significantly by the hatchery effluent, either before or after installation of settling basins. (Auth.)

17898. Albertson, Roger D., and Fred Schultz. 1968. FISHES OF LITTLE WALL LAKE, 1967. Iowa Acad. of Sci., Vol. 75, pp. 164-169.

Little Wall Lake, Hamilton County, Iowa, was dredged in 1953 to increase recreational facilities. Counts in June-August 1967 averaged about 580 man-hours of boating and water skiing per acre, mostly in the 65-acre dredged portion, but sometimes in other parts of the 273-acre lake. The lake also provides about 500 man-hours of fishing per week. Most of the fish are black bullheads (Ictalurus melas) and crappies (Pomoxis annularis and P. nigromaculatus), 5 to 6 inches long, and too small to be kept by most fishermen. The angler catch of largemouth bass (Micropterus salmoides), bluegills (Lepomis macrochirus), and other game fish large enough to be kept was less than 0.1 per hour. Mark and recapture techniques estimated the bullhead population at 1,703 per acre, or 123 pounds per acre. Bullheads collected after July 15 were thinner than those collected earlier, but black and white crappies increased in weight. The fish population had not changed markedly since 1956. (Authors)

17899. Schindler, D. W. (Fish. and Mar. Serv., Freshwater Inst., Winnipeg, Manitoba, Canada). 1974. EUTROPHICATION AND RECOVERY IN EXPERIMENTAL LAKES: - IMPLICATIONS FOR LAKE MANAGEMENT. Science, 184(4139): 897-899.

Combinations of phosphorus, nitrogen, and carbon were added to several small lakes in northwestern Ontario, Canada, at rates similar to those in many culturally eutrophied lakes. Phosphate and nitrate caused rapid eutrophication. A similar result was obtained with phosphate, ammonia, and sucrose, but recovery was almost immediate when phosphate additions only were discontinued. When two basins of one lake were fertilized with equal amounts of nitrate and sucrose, and phosphorus was also added to one of the basins, the phosphate-enriched basin quickly became highly eutrophic, while the basin receiving only nitrogen and carbon remained at prefertilization conditions. These results, and the high affinity of sediments for phosphorus indicate that rapid abatement of eutrophication may be expected to follow phosphorus control measures. (Auth.)

17900. Maciolek, John A., and Richard E. Brock. 1974. AQUATIC SURVEY OF THE KONA COAST PONDS, HAWAII ISLAND. Sea Grant Advisory Report UNIHI-SEAGRANT-AR-74-04, 73 p.

During a 17-month period beginning July 1972, 318 shoreline ponds were located and surveyed in the five land districts of Hawaii Island's leeward coast. The survey concerned an inventory of environmental and biological characteristics for the purpose of assessing their scientific and natural resource values. This inventory includes all coastal waters--from excavated wells and small fissures to large Hawaiian fishponds--that are not part of the marine ecosystem. Relevant information on geology and terrestrial vegetation is presented. Collectively, the ponds have distinctive environmental features: rocky (lava) basins, usually with biogenic sediments; mostly small (less than 100 sq m in surface area) and shallow (less than 1 m deep); mixohaline water (average salinity 7 °/oo) representing an inland extension of the oceanic water table diluted by subsurface freshwater runoff; and tidal fluctuation of surface level. Characteristic aquatic vegetation consists of the vascular aquatic pondweed, Ruppia maritima, and two types of encrusting algal communities. Pond animal communities are divided into two main groups depending upon their connections to the sea. The 13 ponds with surface connections to the sea have diverse species that are mainly of marine origin. The remaining 305 ponds with only subterranean water connections contain fewer but more distinctive animals. In these "closed" ponds, crustaceans and mollusks are the most abundant and characteristic animals among the 55 taxons recognized. Nine of the most common native species are designated as being representative of this distinctive "anchialine" ecosystem class; representatives included four shrimps, three mollusks, and two fishes. Small red shrimps or opaeula (Halocaridina rubra) are probably the most characteristic species. In addition, several new species of crustaceans and other invertebrates were found during the survey. In final analysis, eight locations were selected as having ponds of exceptional natural geological and biological qualities that deserve protection as a unique and valuable resource. Most are in remote areas between Waiulua Bay (South Kohala District) in the north and Ka Lae (Ka'u District) in the south. Detailed maps and biota catalogs are provided. (Authors)

17901. Proescholt, Terry A., and Kenneth D. Carlander (Iowa State Univ., Ames, Iowa). 1969. MEASUREMENTS OF BOATING AND FISHING, CLEAR LAKE, SUMMER 1968. Proc. Iowa Acad. Sci., Vol. 76, pp. 188-195.

Between June 29 and July 24, 1968, counts of boats and fishermen on Clear Lake were made at scheduled times. The peak count was 258 boats between 2 and 3 P.M. on a Sunday, about 1 boat per 14 acres. The total per week came to 5747 boar hours, with about 35% of it on weekends. Boat usage declined earlier in the evening on Sundays than on other days. Power boats constituted about 45% of the total boat hours, and fishing boats about 25%. Water skiers were most active in afternoon and evening, and most of the sailboating occurred on Sundays. Fishing effort per week was estimated at 8121 man-hours, and the weekly catch at 3135 fish, including 1932 bullheads and 491 walleyes. (Authors)

17902. Chittenden, Mark E., Jr. (Va. Inst. of Mar. Sci., Gloucester Point, Virginia 23062). 1974. TRENDS IN THE ABUNDANCE OF AMERICAN SHAD, Alosa sapidissima, IN THE DELAWARE RIVER BASIN. Chesapeake Science, 15(2): 96-103.

The American shad, Alosa sapidissima, was very abundant in the Delaware River Basin until 1901. Annual commercial landings from 1890 to 1901 (about 11 to 17 million lb) were several times greater than in any other river system. Abundance declined rapidly after 1901, except for a resurgence in 1907 which may be interpreted as evidence that by 1903 pollution was affecting successful seaward movement of young produced in the Delaware River. Less than 0.5 million lb. were landed in 1920. Abundance has remained low since 1920, although fluctuations have occurred. Extra-Delaware Basin fish mix with Delaware Basin fish at the mouth of Delaware Bay. It is not clear how far extra-Delaware Basin fish penetrate up-bay, but they do not enter fresh water of the Delaware River. Records available for several years in the period 1890-1901 indicate that 39% of the total Delaware Basin landings came from fresh water of the Delaware River, suggesting that landings at that time were primarily dependent on Delaware Basin fish. (Auth.)

17903. King, Laurence R. (Dept. of Zool. and Entomol., Iowa State Univ., Ames, Iowa 50010). 1973. COMPARISON OF THE DISTRIBUTION OF MINNOWS AND DARTERS COLLECTED IN 1947 AND 1972 IN BOONE COUNTY, IOWA. Proc. Iowa Acad. Sci., Vol. 80, pp. 133-135.

If the entire watershed of Boone County, Iowa, is considered, the same species of minnows and darters were found in the prairie streams and Des Moines River in 1972 as in 1947. Specific changes in relative abundance of minnows and darters over the 25-year period were generally correlated with habitat alteration. Habitat alteration resulting in change of bottom type allowed increase in abundance of several minnow species. Increase in water temperature and change of bottom type has contributed to the disappearance of the fantail darter from Bluff Creek. The similarity in relative abundance of fishes in 1947 and 1972 indicates that there have been few significant cases of stream habitat alteration in Boone County. (Auth.'s synopsis)

17904. Bailey, W. M., and R. L. Boyd (Ark. Game and Fish Comm., Little Rock, Arkansas). 1972. SOME OBSERVATIONS ON THE WHITE AMUR IN ARKANSAS. Hyacinth Control Journal No. 10, pp. 20-22; Weed Abstracts, 23(1): abstract No. 115, 1974.

In 1970 spawning attempts with white amur (Ctenopharyngodon idella) in Arkansas were successful. Stocking a 300-acre lake with 7 adult white amur/acre practically eliminated Ceratophyllum demersum and all other submersed weeds, while the fish effectively controlled vegetation in hatcheries without affecting the growth of catfish, bass or bream.

17905. Applegate, Richard L. (So. Dakota Coop. Fish Unit, So. Dakota State Univ., Brookings, So. Dakota 57006). 1973. CORIXIDAE (WATER BOATMEN) OF THE SOUTH DAKOTA GLACIAL LAKE DISTRICT. Ent. News, 84: 163-170.

Corixids collected in August 1970, from lakes, marshes, and the Big Sioux River of the South Dakota Glacial Lake District indicated distinct differences in habitat type and species composition. Trichocorixa borealis, T. naias, T. verticalis, Palmacorixa bueoni, and Cenocorixa dakotensis comprised 96 percent of 4,543 specimens from 43 lakes. Trichocorixa naias, T. verticalis, Hesperocorixa vulgaris, Sigara alternata and S. bicoloripennis comprised 91 percent of 1588 specimens from 28 marshes. Percent composition and percent occurrence suggests that T. borealis, C. dakotensis, Sigara decoratella and S. conocephala were predominantly lake species. Corisella tarsalis, Callicorixa audeni, Cenocorixa utahensis and H. vulgaris were marsh species. Sigara grossolineata was a river species, T. verticalis a lake-marsh species, P. bueoni a lake-river species, S. alternata a marsh-river species, and T. naias and Sigara solensis were lake-marsh-river species. A key to the Corixidae of South Dakota is given.

17906. White, Glenn E. (Dept. of Biol. Sci., Eastern Kentucky Univ., Richmond, Kentucky). 1974. PARASITES OF THE COMMON WHITE SUCKER (Catostomus commersoni) FROM THE KENTUCKY RIVER DRAINAGE. Trans. Amer. Microsc. Soc., 93(2): 280-282.

Thirteen helminths, one leech, and one copepod parasite were recovered from the common white sucker in the Kentucky River drainage system, as follows: Acanthocephalus jacksoni, Octospinifer macilentus (Acanthocephala); Clinostomum marginatum, Neascus sp., Phyllodistomum lysteri, Plagioporus serotinus, Triganodistomum attenuatum (Trematoda); Glaridacris catostomi, Hunterella nodulosa, Monobothrium hunteri (Cestoidea); and an unidentified caryophyllaeid; Contracaecum sp., and Philometra cylindracea (Nematoda); Piscicola punctata (Hirudinea); and Lernaea cyprinacea (Copepoda). (Auth.)

17907. Graynoth, E. 1974. THE AUCKLAND TROUT FISHERY. N. Z. Ministry of Agric. and Fisheries, Fish. Tech. Report No. 89, 22 p., Wellington, N. Z.

This report describes the trout fisheries of the Auckland Acclimatisation District. It is based on angling results collected since 1948 by seven angling diary schemes. In this district angling license sales have remained stable for many years in comparison to shooting license sales which have steadily increased. The average men's whole season license holder fishes for about thirteen days per season to catch 11 fish. The total district catch of fish is between 35 and 40,000 fish and the total angling effort between 55,000 and 60,000 days per annum. Every year anglers spend over $200,000 on fishing. Rainbow trout are the principal species caught. Brown trout are caught in small numbers in the northern part of the district, but constitute about 50% of the catch in the southern Waipa and Wanganui Rivers. There has been no definite historical change in species distribution or fish size over the past twenty years. No direct surveys of the fish stocks have been carried out but anglers' catch rates are fairly low and it is thought that the stocks also are low. It is suspected that the anglers' catch is a fair proportion of the stocks. Suitable spawning gravels are limited in area but may be adequate for the stocks present. There is a need for a quantitative assessment of the extent of spawning gravels and its relation to the stocks of trout. The thirteen principal waters and anglers' catches are described. The fisheries regulations are fairly lenient and have little restrictive action on the catch. More scientific studies need to be made if the management of the angling waters is to be improved. (Auth.)

17908. Jangaard, P. M. (Dept. of the Environ., Fish. and Mar. Serv., Atlantic Regional Office (Research), Halifax, Nova Scotia, Canada). 1974. THE CAPELIN (Mallotus villosus): BIOLOGY, DISTRIBUTION, EXPLOITATION, UTILIZATION, AND COMPOSITION. Bull. Fish. Res. Board Can. No. 186, 70 p., illus.

The rapidly increasing interest in the use of capelin for human consumption has led to the production of this bulletin. The following topics are examined: life history, including systematic position, common names, general description, distinctive features, meristic characteristics, growth, and feeding; occurrence; fishery procedures, handling, unloading, and use of preservatives; utilization, processing, and equipment; and chemical and nutritional composition of whole capelin, capelin meal, and oil. The capelin, Mallotus villosus, a small, pelagic fish belonging to the family Osmeridae, occurs in large quantities in the cold waters of the northern hemisphere. Distribution is circumpolar with large stocks found in the Barents Sea, around Iceland and Greenland, and in Canadian waters from Nova Scotia to Labrador. Small stocks occur on both sides of the North Pacific. Spawning occurs in March-April in northern Norway and Iceland, and in June-July in Newfoundland and Labrador. It takes place on beaches in some areas, but also in deeper waters. Spawning stock consists almost exclusively of 3- and 4-year-old fish. Most capelin die after spawning. The fishery is carried out chiefly with purse seines or midwater trawls; small quantities are taken inshore in traps, seines, etc. Barents Sea stocks are heavily exploited, but there are large underutilized stocks in the northwest Atlantic. Formerly, small quantities of capelin were used for food in fresh, salted, and dried forms. At present, most capelin catches are used for production of meal and oil. However, various frozen and canned products have recently been developed and test-marketed, Japan being the leading importer and consumer. The fat and water contents of capelin fluctuate seasonally; the fat

content can be as low as 1-2% following spawning, but goes above 20% in the fall. As capelin and capelin products are nutritionally of high quality, the use of capelin for human consumption will no doubt show a rapid increase over the next few years. (Auth.)

17909. Kushlan, James A. (Dept. of Biol., Univ. of Miami, Coral Gables, Fla. 33124). 1974. EFFECTS OF A NATURAL FISH KILL ON THE WATER QUALITY, PLANKTON, AND FISH POPULATION OF A POND IN THE BIG CYPRESS SWAMP, FLORIDA. Trans. Amer. Fish. Soc., 103(2): 235-243.

A naturally occurring fish kill took place during the southern Florida dry season when receding water levels forced aquatic organisms out of shallow swamps and into a small pond. Physico-chemical parameters of water quality varied greatly from their usual range as did the abundance of phytoplankton which reached a peak of 2.5×10^9 cells per liter. The fish kill had no effect on the long-term limnological characteristics of the pond, as water quality returned to normal range within 2 months and phytoplankton disappeared within 1 month after the fish kill. The species of fish in the pond showed a range of susceptibility to low oxygen concentration and other aspects of the fish kill. They were classified into three categories based upon their survival: Notemigonus crysoleucas, Lucania goodei, and all centrarchids were eliminated rapidly; Fundulus chrysotus, Poecilia latipinna, Heterandria formosa, and Ictalurus natalis were either eliminated late in the fish kill or survived in numbers lower than measurable by methods used in this study; Lepisosteus platyrhincus, Gambusia affinis, Jordanella floridae and the prawn Palaemonetes paludosus survived the fish kill in moderate densities of 0.6 to 6 individuals/m^2. In three species of Lepomis, larger fish died before smaller ones. Six of 22 species of fish and only 0.6% of the previous fish population survived the fish kill. (Auth.)

17910. Groninger, Herman S., Jr., and Ruth Miller (U.S. Dept. of Comm., NOAA, NMFS, Pacific Fishery Products Technology Center, Seattle, Washington 98112). 1974. PREPARATION AND USE OF A MODIFIED PROTEIN BINDER IN THE FABRICATION OF FEED FOR POST-LARVAL AQUACULTURAL ANIMALS. J. Fish. Res. Board Can., 31(4):.477-479.

The laboratory preparation of a modified protein (acylated) binder is described. The important feature of this binder is that it enables a rapid and simply effected conversion of a liquid feed to a solid feed. A laboratory method is given for the fabrication of aquacultural feed using this modified binder. A typical feed that has been prepared with this binder has an elastic texture, resists fragmentation in water, and is readily acceptable to test animals. (Authors)

17911. Mehta, I., and R. K. Sharma (Chambal Land and Water Use Management Project, Kota, Rajasthan, India). 1972. CONTROL OF AQUATIC WEEDS BY THE WHITE AMUR IN RAJASTHAN, INDIA. Hyacinth Control Journal No. 10, 16-19; Weed Abstracts, 22(12): abstract 2880.

A series of experiments conducted in fish ponds showed white amur (Ctenopharyngodon idella) was a voracious eater of all the dominant weeds of the area. Fish of approximately 65 g preferred Chara sp., Najas foveolata and Vallisneria spiralis while 200-g fish preferred Potamogeton pectinatus, P. nodosus, V. spiralis and Najas sp. and consumed only small amounts of Hydrilla verticillata, P. perfoliatus and narrow-leaf cat-tail (Typha sp.). Large fish may flourish on these weeds and may be able to masticate leaves of tough plants and fibrous grasses. It is concluded that the white amur can be used with benefit where herbicides cannot, but that information is needed regarding the optimum rates of stocking with fish of various sizes to achieve weed control. (From summ.)

17912. Eggleston, D. 1974. FISHERIES DIVISION INVESTIGATIONS. PROGRESS REPORT 1970. New Zealand Ministry of Agric. and Fisheries, Fisheries Technical Report No. 113, 16 p., Wellington, New Zealand.

A very brief summary on progress of all their research projects.

17913. Odense, P. H., and V. H. Logan (Dept. of the Environ. Fish. and Mar. Serv., Halifax Lab., Halifax, Nova Scotia, Canada). 1974. MARKING ATLANTIC SALMON (Salmo salar) WITH OXYTETRACYCLINE. J. Fish. Res. Board Can., 31(3): 348-350.

The marking of Atlantic salmon (Salmo salar) by feeding oxytetracycline has been investigated. Fluorescent marks, readily visible for up to 2 yr postfeeding have been observed in centrum and rib with the former being superior for gross observation. Best results were obtained with fish more than 1 yr old. Sampling, storage, and observation techniques are discussed. (Authors)

17914. French, Robert R., and Richard G. Bakkala (Northwest Fish. Center, NMFS, NOAA, 2725 Montlake Blvd East, Seattle, Washington 98112). 1974. A NEW MODEL OF OCEAN MIGRATIONS OF BRISTOL BAY SOCKEYE SALMON. NOAA Fish. Bull., 72(2): 589-614.

A model is presented that describes the ocean migrations of Bristol Bay sockeye salmon from the time the fish leave the estuary until they return as adults. Bristol Bay sockeye salmon inhabit extensive areas of the ocean during various stages of their life at sea, ranging across most of the North Pacific Ocean from about long. 140°W to near long. 167°E and from near lat. 46°N to lat. 58°N in the central Bering Sea. Initially, their migration route takes the young juveniles from the eastern Bering Sea through the central and eastern Aleutian Islands passes to south of lat. 50°N where in late winter they become broadly distributed across the North Pacific Ocean. In June the immature fish start a northward movement and in summer occupy waters from lat. 50°N to the Aleutian Islands and over an east-west area from long. 160°W to 170°E; part of the population moves north into the Bering Sea. The following winter the sockeye separate into immature and maturing components. Those that will mature remain in waters north of lat. 50°N from whence they will migrate back to Bristol Bay in the spring with the major proportion entering the Bering Sea through passes east of long. 175°W. The immature fish that will remain at sea another year move south of lat. 50°N in the winter and early spring, then essentially repeat the migration they had made the previous summer. These fish as maturing fish the following winter and spring follow the same migration route as the earlier maturing group. No direct relationship was found between the distribution and migration of the sockeye and defined oceanographic features of the Subarctic Region of the North Pacific Ocean. (Authors)

17915. Zimmerman, Charles J., Jr., and Harold H. Burgess (U.S. Fish and Wildl. Serv., Lacreek Natl Wildl. Refuge, Martin, So. Dakota 57551). 1973. FISHES OF LACREEK NATIONAL WILDLIFE REFUGE, BENNETT COUNTY, SOUTH DAKOTA. Proc. S. D. Acad. Sci., Vol. 52, pp. 88-94.

Fish populations of Lacreek National Wildlife Refuge, Bennett County, South Dakota, represent 8 families, and 22 species. This paper provides a list of the fish collected from the refuge pools and streams during the period 30 August, 1972 - 19 October, 1972. (Authors)

17916. Wolke, R. E., and T. L. Meade (Mar. Pathol. Lab., Univ. of Rhode Island, Kingston, Rhode Island). 1974. NOCARDIOSIS IN CHINOOK SALMON. J. Wildl. Diseases, 10(2): 149-154.

Granulomatous oral masses were observed in two chinook salmon (Oncorhynchus tschawytscha) smolts with systemic nocardiosis. Gross and histopathological lesions are described indicating the proliferative inflammatory nature of this disease. (Authors)

17917. Murtaugh, Patricia A., John E. Halver, and Jules A. Gladner (Natl. Inst. of Arthritis, Metabolism and Digestive Diseases, U. S. Dept. of Health, Education and Welfare, Bethesda, Maryland 20014). 1973. CROSS-LINKING OF SALMON FIBRINOGEN AND FIBRIN BY FACTOR XIII AND TRANSGLUTAMINASE. Biochem. and Biophysical Research Communications, 54(3): 849-855.

Unlike mammalian species, salmon plasma contains 2 cross-linking enzyme systems: Factor XIII and a transglutaminase which appears to be similar in its action to that described by Folk and Chung. Also, salmon plasma contains an exceedingly active protease which possesses the ability to rapidly destroy fibrinogen clottability even when the plasma is stored at a temperature of -20°C. (Authors' summ.)

17918. Drummond, Robert A., Gayle F. Olson, and Allan R. Batterman (U.S. Environ. Protection Agency, Natl Water Qual. Lab., 6201 Congdon Blvd, Duluth, Minnesota 55804). 1974. COUGH RESPONSE AND UPTAKE OF MERCURY BY BROOK TROUT, Salvelinus fontinalis, EXPOSED TO MERCURIC COMPOUNDS AT DIFFERENT HYDROGEN-ION CONCENTRATIONS. Trans. Amer. Fish. Soc., 103(2): 244-249.

The lowest concentration of methylmercuric chloride (MMC) and mercuric chloride added to Lake Superior water that caused a significant increase in cough frequency in brook trout was 3 μg Hg/liter. Cough frequency is a good short-term indicator of the long-term effects of MMC. The response can be used to predict the safe concentration of mercuric chloride since the long-term effects of this compound are not known. Increases in cough frequency were proportional to the concentration (from 3 to 12 μg Hg/liter) of both compounds at pH 7.5. The fish were more responsive to MMC when the pH of the test water was lowered to 6.0; response to mercuric chloride was not changed by lowered pH. Fish exposed to MMC at pH 6.0 contained more total mercury in their gills and red blood cells than fish tested at pH 9.0. The uptake of mercury by brook trout exposed to mercuric chloride did not differ significantly at pH 6.0 and 9.0. (Authors)

17919. Graynoth, E., and W. Skrzynski. 1974. THE NORTH CANTERBURY TROUT AND SALMON FISHERY. N. Z. Ministry of Agric. and Fish., Fisheries Technical Report No. 90, 41 p., Wellington, New Zealand.

This report describes the trout and salmon fisheries of the North Canterbury Acclimatisation District. It is based on angling results collected since 1947 by eight angling diary schemes and two postal questionnaire schemes run in 1958 and 1963. The popularity of freshwater angling in the North Canterbury District has been rapidly increasing in the last 20 years. The average men's whole season license holder fishes for about 18 days per season to catch nine fish. The total district catch is approximately 90,000 fish and the total angling effort 210,000 days per annum. The total expenditure on fishing is about $1,000,000 per annum. Brown trout are the main species caught and are predominant in the rivers and most lakes. Rainbow trout are caught in several of the high country lakes and landlocked quinnat salmon in Lake Coleridge. Sea-run quinnat migrate up the major rivers and a small run enters the Ashley River. The distribution of species is now relatively stable. The trout are generally larger than in the districts to the south. A deterioration in trout size has been noticed in only a few waters. It is unlikely that any waters suffer from overcropping but the stocks in most have not been assessed. The 31 principal waters and anglers' catches are described. Fisheries management has suffered from changes in policy and the angling regulations are generally complex and ineffective. (Authors' summ.)

17920. Holland, Wallace E., Michael H. Smith, J. Whitfield Gibbons, and Douglas H. Brown (Savannah River Ecol. Lab., Drawer E, Aiken, So. Carolina). 1974. THERMAL TOLERANCES OF FISH FROM A RESERVOIR RECEIVING HEATED EFFLUENT FROM A NUCLEAR REACTOR. Physiological Zoology, 47(2): 110-118.

It is shown that at least one species of warm-water fish, the bluegill (Lepomis macrochirus), can adjust to elevated temperatures in a natural environment by becoming more tolerant.

17921. Komarovskii, F. Ya. (Inst. of Hydrobiol., Ukrainian SSR Acad. of Sci., Kiev, USSR). 1970. EFFECT OF DIURON ON THE FRACTIONAL COMPOSITION OF FISH SERUM PROTEIN. In: Eksperimental'naya Vodnaya Toksikologiya Materialy Vsesoyuznogo Simpoziuma (1st), 30-31; From Health Aspects of Pesticides 72-2408; Weed Abstracts, 23(1): abstract No. 186, 1974.

Roach and ide were kept in water containing diuron at 0.2 and 2.4 mg/litre for 75 days. Examination of blood serum protein by electrophoresis revealed changes in composition, in particular an increase in total globulin content (12.6% for α-globulin and 39.9% for β-globulin). Reduction in albumin and γ-globulin contents were 11.2% and 36.3% respectively. These changes may be due to dysfunction in the protein production in the liver.

17922. Knight, Homer T., and Leon J. Olson (Sci. Div., Univ. of Wisconsin-Parkside, Kenosha, Wisconsin). 1974. MERCURY DISTRIBUTION IN AMERICAN SMELT FROM LAKE MICHIGAN. Amer. Midl. Nat., 91(2): 451-452.

The average total mercury concentration in 75 American smelt, Osmerus mordax (Mitchill), from Lake Michigan was 8.22 ng/g with significant differences in age groups and sexes. (Authors)

17923. Lapin, V. I. (Dept. of Ichthyol., Moscow Univ., Moscow, USSR). 1973. SEASONAL VARIATIONS IN THE BIOCHEMICAL COMPOSITION OF THE ORGANS AND TISSUES OF THE WHITE SEA FLOUNDER [Platichthys flesus bogdanovi (Sandeberg)]. J. Ichthyol., 13(2): 262-274.

An investigation has been made of the nature of variation in the total content of moisture, protein, the defatted nonprotein dry residue and lipids, and also the overall fractional composition of the lipids and the dynamics of lipid composition in the muscles, liver and gonads of the White Sea flounder in the course of feeding, maturation of the gonads and spawning. (Auth.)

17924. Zitko, P., W. V. Carson, and W. G. Carson (Fish. Res. Board Can., St. Andrews Biol. Sta., New Brunswick, Canada). 1973. PREDICTION OF INCIPIENT LETHAL LEVELS OF COPPER TO JUVENILE ATLANTIC SALMON IN THE PRESENCE OF HUMIC ACID BY CUPRIC ELECTRODE. Bull. of Environmental Contamination and Toxicology, 10(6): 265-271; Selected Water Resources Abstracts, 7(12): p. 53, 1974.

This paper deals with the toxicity of copper and zinc to juvenile Atlantic salmon in the presence of humic acid, and with predictions of incipient lethal levels (ILL) of copper from the potential of a cupric ion selective electrode. The ILL of copper increases with increasing concentration of humic acid. The potential of the cupric ion selective electrode is a linear function of the total copper concentration in semilogarithmic coordinates. The ratio of predicted to calculated ILL's decreases with increasing hardness due to decreased binding of copper by humic acid at higher hardness. Humic acid at concentrations of 5 and 10 mg/l has no effect on the ILL of zinc to juvenile Atlantic salmon, possibly due to lower stability of humic acid-zinc complexes. The zinc - fulvic acid complex is approximately 10 timess less stable than the corresponding copper - fulvic acid complex. The presented data indicate that the cupric ion selective electrode is a useful tool for preducting ILL of copper to juvenile Atlantic salmon in the presence of humic acid. The technique may very likely be extended to other copper-complexing substances such as lignosulfonates, pulp mill effluents in general, and various organic compounds.

17925. Middaugh, Douglas P., and Ruth L. Yoakum (Environ. Protection Agency, Bears Bluff Field Site, P. O. Box 368, John's Island, So. Carolina). 1974. THE USE OF CHORIONIC GONADOTROPIN TO INDUCE LABORATORY SPAWNING OF THE ATLANTIC CROAKER, Micropogon undulatus, WITH NOTES ON SUBSEQUENT EMBRYONIC DEVELOPMENT. Chesapeake Science, 15(2): 110-114.

We studied the feasibility of spawning and rearing the Atlantic croaker, Micropogon undulatus, in the laboratory. Adult croaker were collected during mid-October, 1972, placed in flowing seawater holding tanks, and administered injections of either 125 or 250 I. U. of chorionic gonadotropin three times per week for three weeks. An apparent period of latency (6-7 days) was observed between the initial hormone injections and successful ovulation. Fish dosed at the 125 I. U. level were successfully spawned and eggs and larval development monitored. Larvae were carried through to 4 days after hatching when mass mortalities occurred, apparently as a result of nutritional deficiencies. (Authors)

17926. Schultze, Ronald F., and C. David Vanicek. 1974. AGE AND GROWTH OF LARGEMOUTH BASS IN CALIFORNIA FARM PONDS. Calif. Fish and Game, 60(2): 94-96.

Largemouth bass Micropterus salmoides growth rate was studied in three farm ponds located in the foothills of the central Sierra Nevada. Size of ponds varied from 0.8 to 14.5 ha. Statistics are given on fork length and scale radius.

17927. Bamford, O. S. (Zool. Dept., Univ. of Bristol, Bristol, England). 1974. RESPIRATORY NEURONES IN RAINBOW TROUT (Salmo gairdneri). Comp. Biochem. Physiol., 48(1A): 69-76.

The location and function of respiratory neurones have been studied in trout. Respiratory neurones were detected in the small-celled portions of the trigeminal, facial and glossopharyngeal motor nuclei. Neural activity could be detected in any phase of the respiratory cycle. There was no correlation between the timing of activity at a recording site and its anatomical position in the brainstem. From the anatomical positions of the recorded units, the relationship of their activity to the respiratory cycle and their behaviour during hypoxia, it is concluded that most of the recordings made in this study were of interneurone activity. (Auth.)

17928. Jensen, K. W., and E. Snekvik. 1972. LOW pH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY. Ambio, 1(6): 223-225, illus.; Selected Water Resources Abstracts, 7(10): p. 72, 1974.

Low pH levels in rivers of southern Norway have resulted in the mortality of trout and salmon. Experiments show that the lower pH limits for normal hatching and fry development are pH 5.0-5.5 for salmon, 4.5-5.0 for sea trout and ca pH 4.5 for brown trout. An examination of the relation between pH values in the rivers and lakes in question and salmon and trout populations shows that these fish populations generally decrease in size as the pH level decreases. -- Biological Abstracts, Inc.

17929. Daborn, Graham R. (Dept. of Zool., Univ. of Alberta, Edmonton, Alberta, Canada). 1974. BIOLOGICAL FEATURES OF AN AESTIVAL POND IN WESTERN CANADA. Hydrobiologia, 44(2-3): 287-299.

The seasonal changes in flora and fauna in an aestival pond in central Alberta, Canada, were studied through a complete annual cycle during which an exceptional decrease in water volume occurred in response to lower than normal rainfall. Substantial changes took place between successive summers in the species composition of the phytoplankton, Rotifera, Oligochaeta, Copepoda and Zygoptera. Some of the incoming species, particularly Chaetogaster diaphanus (Oligochaeta) and three species of Lestes (Zygoptera) are often associated with more temporary habitats of the region. The instability of species composition and productivity of the community is discussed in terms of the trophic position of aestival lakes and ponds. (Auth.)

17930. Moore, Charles J., and Dennis T. Burton (Acad. of Nat. Sciences of Philadelphia, Benedict Estuarine Laboratory, Benedict, Maryland 20612). 1974. MOVEMENTS OF STRIPED BASS, Morone saxatilis, TAGGED DURING LATE FALL IN CHESAPEAKE BAY, MARYLAND. Assoc. Southeastern Biol. Bull., 21:70.

Between 27 October and 1 December 1972 a total of 1,762 striped bass (Morone saxatilis) were tagged and released in the vicinity of the Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland. All fish were obtained from a pound net approximately five miles south of the release point with the majority of specimens ranging from 28 to 36 centimeters in total length. Results, based on 705 returns (40%), indicate: (1) striped bass 28 to 36 centimeters in total length are very active throughout the winter season, (2) striped bass that utilize the Calvert Cliffs area during the late fall travel throughout the Chesapeake Bay during the winter months with the majority overwintering in the open water of the Chesapeake Bay in the Annapolis-Rock Hall area, (3) by the following spring these fish travel into the upper reaches of every major tributary of the Chesapeake Bay and (4) few striped bass of this size leave the Chesapeake Bay estuary. (Authors)

17931. Pappas, C. J., C. W. Deyoe, and O. W. Tiemeier (Kansas State Univ., Manhattan, Kansas). 1974. USES OF CATFISH-PROCESSING BYPRODUCTS AND UNDESIRABLE SPECIES OF FISHES IN FORMULATED CATFISH FEEDS. Feedstuffs, 46(6): 29; Marine Fisheries Abstracts, 27(4): p. 21.

17932. Nanba, Kenji, Shiro Murachi, Shinji Kawamoto, and Yoshihisa Nakano (Dept. of Fish., Fac. of Fish. and Animal Husbandry, Hiroshima Univ., Fukuyama, Japan). 1973. STUDIES ON ELECTROCARDIOGRAMS OF FISHES I - TEST OF METHOD TO DETECT THE ECG FROM FISH. J. Fac. Fish. Anim. Husb. Hiroshima Univ., 12(2): 147-154. In Japanese w/English tables, figs., and summary.

Examinations have been made to find out the suitable method of detecting the ECG from fish for the purpose of pathological physiology study. The results obtained can be summarized as follows; Unipolar leads of ECG from the surface of the heart. ECG's, directly recorded on the surface of the carp heart, consisted of P wave followed by QRS complex and a T wave. Other waves derived from the heart could not be detected. Unipolar lead and bipolar lead of ECG from the body surface. i) ECG could be recorded from almost all the body surface of carp by using unipolar lead. The amplitude of the QRS complex as about 40 μV in the vicinity of the heart. ii) ECG's obtained by using bipolar leads from pectoral fins of carp were stable and the QRS complex appeared as a QS type ordinarily and exceptionally as a QR type. This method may be useful for the pathological physiology study of fish. The amplitude of QRS complex was 70 μV on the average. Bipolar lead of ECG from within the body. Electrodes were inserted into the chest with operation. ECG's by this method were easily detected from carp, crucian carp, rainbow trout, yellow tail, sea bream under swimming condition in aquariums. The patterns of ECGs from the chest cavity were similar to those from pectoral fins of carp. The amplitudes of the QRS complex were 1.12 mV in carp, 0.40 mV in crucian carp, 1.15 mV in rainbow trout, 0.88 mV in yellow tail, 0.12 mV in sea bream. From the above results, it is apparent that the bipolar lead from the chest cavity is the most useful and suitable method to study fish ECG pathophysiologically and ecologically. (Authors' summ.)

17933. Graynoth, E., and W. Skrzynski. 1974. THE SOUTHLAND TROUT FISHERY. N. Z. Ministry of Agric. and Fish., Fisheries Tech. Report No. 99, 24 p., Wellington, New Zealand.

This report describes the trout fishery of Southland Acclimatisation District. It is based on angling results collected since 1947 by eight angling diary schemes. Angling is popular in the district but in recent years license sales have dropped slightly. The average Mens Whole Season License Holder fishes for about 15 days to catch 17 fish per season. The total district crop has only increased slightly from about 90,000 fish in 1947 to 110,000 in 1967. The total angling effort in 1967 was estimated at 125,000 days. Brown trout are the principal species caught. In the Waiau River some rainbow trout and Atlantic salmon are caught. The trout caught are small and there has been no change in species composition, distribution, or fish size for very many years. The crop of fish by anglers is high but it is thought that fish densities are also high and that they will not be affected by anglers' crop. No hatchery liberations are carried out, the stocks being maintained by natural production. The nineteen major waters and anglers' catches are described. The fisheries regulations are very lenient and fisheries management is on a sound scientific basis. (Authors' summ.)

17934. Laser, Kenneth D., Clair G. Rausch, Craig L. Olson, and Kenneth D. Carlander (Teacher, Culver Military Acad., Culver, Indiana). 1969. FISH DISTRIBUTION IN THE SKUNK RIVER BELOW AMES, IOWA. Proc. Iowa Acad. Sci., Vol. 76, pp. 196-204.

The Skunk River has been straightened most of the way from Ames to Colfax. In the summer of 1968, 24 species of fish were collected. There were few species other than minnows, and red shiner (Notropis lutrensis), bigmouth shiner (N. dorsalis) and sand shiner (N. straminous) were most abundant. Water levels were above normal during the study and effects of pollution upon fish distribution were not pronounced. The diversity index, $\bar{d}$, at the station where treated-sewage wastes entered, was lower than at stations up and down stream but was higher than at the four stations farthest downstream. Uniformity of habitat resulting from stream-straightening probably limits species diversity. (Authors)

17935. McAllister, P. E., and K. S. Pilcher (Dept. Microbiol., Oregon State Univ., Corvallis, Oregon). 1974. AUTOINTERFERENCE IN INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS OF SALMONID FISH. Proc. Soc. Exp. Biol. Med., 145: 840-844; Fish Health News, 3(2): p. 8.

When serial passage of infectious hematopoietic necrosis virus was carried out in cultures of a salmon cell line, using undiluted virus inoculum at each transfer, the resulting yield of infectious virus was very significantly lower than in parallel cultures prepared with dilute virus inoculum. Under these conditions of autointerference, the morphology of the progeny virions was altered. Three types were observed, with mean lengths of 188, 118, and 81 nm respectively. Roughly 80% fell into the two shorter categories. When a dilute virus inoculum was used, almost all progeny virions belonged to the class with a mean length of 188 nm. (Authors)

17936. Huckins, James N., Jerome E. Swanson, and David L. Stalling (Fish-Pesticide Res. Lab., Route 1, Columbia, Missouri 65201). 1974. PERCHLORINATION OF POLYCHLORINATED BIPHENYLS. Reprint: J. Assoc. Off. Anal. Chem., Vol. 57, pp. 416-417.

A simple and efficient method for the perchlorination of polychlorinated biphenyls (PCBs) to decachlorobiphenyl, using antimony pentachloride, is described. Average yields of decachlorobiphenyl from 3 individual samples of Aroclors 1016 and 1254 were 85 and 104%, respectively. Bromine was identified as a contaminant in certain lots of antimony pentachloride. PCB perchlorinations with bromide-contaminated antimony pentachloride resulted in significant amounts of bromononachlorobiphenyl. (Authors)

17937. FAO of the United Nations (Rome, Italy). 1973. FAO AQUACULTURE BULLETIN. A QUARTERLY NEWS DIGEST OF AQUACULTURE RESEARCH AND DEVELOPMENT. FAO Aquacult. Bull., 6(1): 32 p., illus.

Text includes: From research institutions...New aquaculture research in Utah - Sexing of Silurus glanis - Induced breeding and larval rearing of bream and bass - Induced spawning of pompano and sea bass - Production of monosex and sterile fish - Use of marine catfish pituitary for spawning Indian major carps - Collection of flat oyster spat - Controlled reproduction and rearing of Pecten maximus - Experimental culture of characids and tilapia in Colombia - Polyculture of carps - Culture of spotted seatrout and yellowfin menhaden - Shrimp culture - Shrimp culture investigations at Conway - Silo culture of chinook salmon - Cage-trap culture of catfish - Experimental shellfish culture in Brazil - Aquaculture in thermal effluent - Mass algal culture in oxidation ponds. Aquaculture development...American Samoa - Australia - France - French Polynesia - Grand Cayman Island (West Indies) - Hungary - India - Israel - Italy - Japan - Korea, Rep. of Malaysia - Singapore - United Kingdom - United States. Fish diseases and their control...Cooperative fish disease project in the United States - Trout health course in Scotland - National survey of fish health problems and needs in the United States - Branchiomycosis in North American fishes - Vibriosis in Atlantic salmon - Channel catfish viral disease - Mycotic syndrome of salmonids in France. Fish and shellfish introductions...Fish introductions in Colombia - Exotic fish in Swaziland - Coho salmon in the Republic of Korea - Introduction of Australian crayfish (marron) into the United States. (From contents)

17938. Thompson, Paul E., William A. Dill, and Gerald Moore (1404 Namassin Road, Alexandria, Virginia 22308). 1973. THE MAJOR COMMUNICABLE FISH DISEASES OF EUROPE AND NORTH AMERICA. A REVIEW OF NATIONAL AND INTERNATIONAL MEASURES FOR THEIR CONTROL. FAO, Rome, Italy, EIFAC Technical Paper No. 17, supplement 1, 48 p.

17939. Cordero del Campillo, M., and Alvarez Pellitero, M/.P. (Univ. of Oviedo, Spain). 1974. FISH DISEASE PROBLEMS IN SPAIN AND MEASURES FOR CONTROL. Fish Farming International, No. 2, pp. 124-131.

17940. Hiltibran, R. C. (Ill. Nat. History Survey, Urbana, Illinois). 1972. THE HYDROLYSIS OF ADENOSINE TRIPHOSPHATE BY BLUEGILL LIVER MITOCHONDRIA IN THE PRESENCE OF 2, 4, 5-T AND SILVEX DERIVATIVES. Trans. Ill. State Acad. of Sci., 65(1-2): 51-57; From: Health Aspects of Pesticides 73-0959; Weed Abstracts, 23(3): abstract 524, 1974.

In the presence of cadmium and zinc, all forms of 2, 4, 5-T and fenoprop tested (except the sodium salt) inhibited hydrolysis of adenosine triphosphate in bluegill (Lepomis macrochirus) liver mitochondria. Hydrolysis was increased in the presence of manganese by 2, 4, 5-T butyl ester and fenoprop butoxyethanol and propylene glycolbutylether esters. 2, 4, 5-T butyl ester and fenoprop butoxyethanol ester increased hydrolysis with calcium. All the derivatives used except the sodium salts increased the hydrolysis of adenosine triphosphate in the presence of magnesium.

17941. Savvaitova, K. A. (Dept. of Ichthyol., Moscow Univ., Moscow, USSR). 1973. ECOLOGY AND SYSTEMATICS OF FRESHWATER CHARS OF THE GENUS Salvelinus (Nilsson) FROM SOME BODIES OF WATER IN KAMCHATKA. J. Ichthyol., 13(1): 58-68.

Consideration is given in the article to the ecological and morphological characteristics of freshwater forms of chars of the genus Salvelinus in Kamchatka. The ways in which speciation occurs and the systematic position of the chars are discussed. It is concluded that the Arctic char [S. alpinus (L.)] consists of a group of forms at different stages of evolution and establishment. It is possible that in some instances (the "lake char," the "stone char," the Azabach'ye predators and benthophages) the divergence has reached the species level, but there is no direct proof of the irreversibility of the changes. In connection with this the chars investigated should be treated as a single natural grouping without separate taxonomic rank and should be referred to as the S. alpinus complex, having regard to the relations between forms and the processes of speciation in this group, in all their complexity.

17942. Dell, Michael B. (Fish. Res. Inst., Univ. of Washington, Seattle, Washington 98195). 1974. TAG RETURNS AND MOVEMENTS OF RAINBOW TROUT (Salmo gairdneri) AND RAINBOW-STEELHEAD TROUT RELEASED IN THE LAKE WASHINGTON SYSTEM. Trans. Amer. Fish. Soc., 103(2): 250-254.

Similar patterns of dispersion were observed over 90-day periods among hatchery-reared rainbow trout and rainbow-steelhead hybrid trout released in the Lake Washington system in 1966 and 1967. In both experiments 90% of recaptures were within 3.2 km of the release site. Returns were generally the same for the three tags tested (Carlin dangler, Petersen disk, Floy anchor pendant). Of the total fish released in 1966, 47.3% were recovered, and of those in 1967, only 40.5%. A reward was offered in the 1966 experiment. Loosening and loss of tags and infection of tag wounds appeared minimal. (Auth.)

17943. Coutant, C. C., H. M. Ducharme, Jr., and J. R. Fisher (Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, Tennessee 37830). 1974. EFFECTS OF COLD SHOCK ON VULNERABILITY OF JUVENILE CHANNEL CATFISH (Ictalurus punctatus) AND LARGEMOUTH BASS (Micropterus salmoides) TO PREDATION. J. Fish. Res. Board Can., 31(3): 351-354.

Acute cold stress caused increased predation on juvenile channel catfish (Ictalurus punctatus) and largemouth bass (Micropterus salmoides) by unstressed adult largemouth bass when temperature differentials were 9 and 7 C or more, respectively, (base temperatures 16 and 17 C). Predation rate tended to increase exponentially with increasing temperature differential. Catfish held 1 h in the cold water were only slightly less susceptible to predation than were others tested immediately after the temperature change. (Authors)

17944. Johnson, J. L., D. L. Stalling, and J. W. Hogan (Fish-Pesticide Res. Lab., Route 1, Columbia, Missouri 65201). 1974. HEXACHLOROBENZENE (HCB) RESIDUES IN FISH. Bull. Environ. Contam. Toxicol., 11(5): 393-398.

17945. Schupp, Dennis H. 1974. THE FISH POPULATION STRUCTURE AND ANGLING HARVEST OF LAKE OF THE WOODS, MINNESOTA 1968-70. Minn. Dept. of Natural Resources, Div. of Fish and Wildl., Section of Fisheries, Investigational Report No. 324, 16 p.

Lake of the Woods is a 1,485 square mile body of water lying on the international boundary between Minnesota and the Canadian provinces of Manitoba and Ontario. The lake has supported a commercial fishery since 1885. Increases in sport fishing have led to conflicts between commercial and sport fishing interests in recent years, primarily concerned with the walleye harvest. This study was designed to assess the current structure of the fish population, provide a baseline of netting data for future comparisons, and estimate the sport-fishing harvest from Minnesota's portion of Lake of the Woods. Assessment of the population structure was done with standard sampling gillnets used for this work in Minnesota the past 25 years. Six species of fish made up over 99 percent of the gillnet catches. These were walleye, sauger, northern pike, yellow perch, tullibee, and white sucker. Only the tullibee and white sucker are not important in the sport fishery. Pronounced differences in seasonality of catches and in depth distribution were noted among the six species. Future test-netting should sample the same time periods and depth sampled in this study for valid comparisons. The sport fishery harvested an average of 258,147 pounds of fish from Minnesota waters in the three years of study. Walleyes made up 83 percent of the harvest. An annual average of 505,000 man-hours of angling effort was expended, 92 percent of it during the summer season. Nearly all fishing effort was directed at the walleye. Walleyes were caught at a rate of 0.52 fish per man-hour during the summer. This is a high rate of catch compared to other Minnesota waters. The sport fishery harvested 73 percent of the walleyes taken from Lake of the Woods and these fish were younger and smaller than those taken commercially. The average weight of walleyes taken by sport fishing was 1.2 pounds. The total mortality rate for walleyes age four and older was estimated at 55 percent. Reduced fishing pressure on walleyes would probably increase their average size and total production. Northern pike, saugers, and yellow perch were the only other species taken in significant numbers by angling. The populations of all three species appear able to sustain more intensive sport fishing. (Auth.)

17946. Chernyayev, Zh. A. (Limnol. Inst., Siberian Dept., USSR Acad. of Sci., Listvenichnoye Settlement, Irkutsk Province, USSR). 1973. REPRODUCTION AND DEVELOPMENT OF THE BAIKAL LAKE WHITEFISH (Coregonus lavaretus baicalensis Dyb.) IN RELATION TO PROBLEMS OF ARTIFICIAL PROPAGATION. J. Ichthyol., 13(2): 216-230.

A description is given of the spawning grounds of the Baikal lake whitefish (Coregonus lavaretus baicalensis Dyb.) in Mukhor Bay in Lake Baikal. Data are given on spawning conditions, routes of migration and the dynamics of the spawning run with a biological description of the spawning stock. Embryonic development and the larval stanzas of the lake whitefish are described. Consideration is given to fish culture in relation to the biological characteristics of the whitefish in the Maloye More.

17947. Mickewicz, U. E., D. L. Sutton, and R. D. Blackburn (Agric. Res. Cent., Fort Lauderdale, Florida, 33314). 1972. WATER QUALITY OF SMALL ENCLOSURES STOCKED WITH WHITE AMUR. Hyacinth Control Journal, Vol. 10, pp. 22-25; Weed Abstracts, 22(12): abstract 2879.

The introduction of white amur (Ctenopharyngodon idella) to water in small enclosures generally reduced dissolved oxygen and pH, increased water hardness and nitrate N and had no effect on pH or degree of turbidity. The effect of the fish on water quality appeared to increase with decreasing container size.

17948. FAO of the United Nations (Rome, Italy). 1974. DIRECTORY OF INSTITUTIONS ENGAGED IN POLLUTION INVESTIGATIONS. CONTAMINANTS IN AQUATIC ORGANISMS. FAO Fisheries Circular No. 325, 13 p. plus list of institutions, 32 p. (Distribution restricted).

17949. Devaraj, K. V. (Dept. of Fish. and Allied Aquacultures, Auburn Univ., Auburn, Alabama). 1974. FOOD OF WHITE CATFISH, Ictalurus catus (Linn.) (ICTALURIDAE) STOCKED IN FARM PONDS. Int. Rev. Gesamten Hydrobiol., 59(1): 147-151.

Stomach contents of 124 white catfish, Ictalurus catus, ranging from 51 to 431 mm collected from farm ponds of Auburn University, Auburn, Alabama were examined. Fishes in these ponds were given supplemental feed six days a week. Juvenile catfish below 100 mm fed more actively on a variety of food items than larger fish. White catfish measuring 201 mm and above preferred dipterans to other natural food items. In all size groups supplemental feed occupied a dominant position when compared to other food items. Other food items present in the stomachs in varying quantities included detritus, micro-crustaceans, trichopterans, fish remains and miscellaneous items, thus indicating the omnivorous feeding of white catfish. (Auth.)

17950. Pennsylvania State Univ., Dept. of Biology (University Park, Pennsylvania). 1971. HISTOCHEMICAL AND CYTOPHOTOMETRIC ASSAY OF ACID STRESS IN FRESHWATER FISH. EPA, Water Poll. Control Res. Series, May 1971, 113 p, 32 fig., 18 tab., 66 ref. Available from GPO Sup Doc as EP1.16:18050OXJ05/4, $1.25, microfiche from NTIS as PB-227 571, $1.45; Selected Water Resources Abstracts, 7(10): 68, 1974.

The feasibility of using histochemical and histopathological changes in brook trout, longnose dace and fathead minnows as bioindicators of acid pollution was investigated. Laboratory studies entailed using a gravity flow diluter system. Field studies involved using net traps in polluted streams. Exposure durations were 4-5 days and 28-30 days. Histochemical cytophotometric analyses were made of gills, Stannius corpuscle, blood, spleen, kidney and liver. The primary mode of acid toxicant action is gill damage which results in impaired respiratory, excretory and liver functions. Short term indices of acid stress include: colloidal iron and PAS staining of gills and renal Stannius corpuscles. A useful bioindicator of prolonged acid exposure is decreased azure B-RNA staining of liver cells; this assesses the extent of liver impairment and reflects of reduced tolerance of fish to other toxicants. Sublethal levels of acidity are not cumulative. However, pH levels of about 5.0 should be considered hazardous since they prove toxic to breeding fish having increased oxygen needs and also reduce the liver's ability to detoxify noxious substances present in acid polluted waters.

17951. Nye, Gene D., and W. Dale Ward. 1974. WASHINGTON SALMON SPORT CATCH REPORT FROM PUNCH CARD RETURNS IN 1972. Wash. Dept. of Fisheries, 42 p., illus.

Text includes: Director's comment; The 1972 Washington Salmon Sport Fishery; Salmon punch card areas 1 through 12 and major freshwater areas; The 1972 Washington Sport Salmon Catches, number of angler trips, salmon per trip for marine areas and total freshwater catch; The 1972 Washington sport salmon catches by week, number of angler trips, and salmon per trip by marine area including chinook age class for areas 6-12; A summary of 1972 Washington sport salmon catches, number of angler trips and salmon per trip of all marine areas; Washington 1972 sport catch of sub-16-inch coho salmon, area 6 through 12 by week ending and percent of total catch; Washington freshwater salmon catches by stream, January through December 1972; Number of anglers, State of Washington by county, other states and foreign countries, 1972; Number of anglers in Washington compared to total population; 1972 Washington sport salmon catches by area and angler residence in counties of Washington, other states, and foreign countries; A summary of total anglers, marine and freshwater salmon catch by area of residence in the State of Washington, other states, and foreign countries including total catch per angler, 1972; Frequency distribution of salmon anglers and catch of salmon per card, 1972; A summary of Washington sport salmon catches, number of angler trips and salmon per trip by marine areas and freshwater catches comparing 1964-1972 average and 1972; 1972 sport salmon catch statistical data sheet. (From Table of Contents)

17952. Poupa, O., H. Gesser, S. Jonsson, and L. Sullivan (Dept. of Clin. Physiol., Dept. of Zoophysiol. and Dept. of Rehab., Medicine I, Univ. of Göteborg, Sweden). 1974. CORONARY-SUPPLIED COMPACT SHELL OF VENTRICULAR MYOCARDIUM IN SALMONIDS: GROWTH AND ENZYME PATTERN. Comp. Biochem. Physiol., 48(1A): 85-95.

The poikilotherm cardiac ventricle can consist of a spongy core supplied by lacunar blood and a compact shell supplied by coronaries. In the Atlantic salmon (Salmo salar) the relations between body weight, heart weight, ventricle volume and thickness and volume of the compact shell were studied. The proportion of compact tissue increases with the body weight. The rate of this increase is highest during the "smolt" stage. The proportion of compact tissue is not correlated to the ventricle volume. In the rainbow trout (Salmo gairdneri) the activity and isoenzyme pattern of lactate dehydrogenase are the same in the compact and spongy tissue in both summer and winter. The activity of cytochrome oxidase is stable in the compact tissue throughout the year and the same as in the spongy tissue in the winter. In the summer the cytochrome oxidase activity is lower in the spongy core. (Authors)

17953. Auld, A. H., and J. R. Schubel (Chesapeake Bay Inst., The Johns Hopkins Univ., Baltimore, Maryland). 1974. PRELIMINARY OBSERVATIONS ON THE EFFICACY OF A COMMERCIALLY AVAILABLE FUNGAL INHIBITOR AND ITS TOXICITY TO FISH EGGS. Chesapeake Science, 15(2): 115-116.

Both the toxicity and the efficacy of amphotericin B need to be considered completely before it is accepted as a treatment alternative for the control of fungal infestations of fish eggs. It may not prove to be an effective fungal inhibitor at concentrations low enough to use safely with the eggs of some fishes.

17954. Graynoth, E. and W. Skrzynski. 1974. THE NELSON TROUT FISHERY. N. Z. Min. of Agric. and Fish., Fisheries Technical Report No. 119, 35 p., Wellington, New Zealand.

This report describes the trout fisheries of Nelson Acclimatisation District. It is based on angling results collected since 1946 by nine angling diary schemes, one personal canvas in 1951 and two postal questionnaire schemes in 1958 and 1963. License sales have shown fluctuations through the years but are at present increasing. The average men's whole season license holder fishes for about 13 days per season to catch about 10 fish. The total district catch is around 13,000 trout per season. The expenditure on fishing is about $70,000 per season. With the exception of some lakes, brown trout are the principal species caught. The trout are large and have not deteriorated in size for over 20 years and there has been no historical change in the species distribution. The fish densities have not been assessed but it is throught that the anglers' crop is a small proportion of the stocks. Fifteen principal waters and anglers' catches are described. The fisheries regulations are fairly lenient. The Society is instituting a scientific management policy which should improve the angling in years to come. (Authors' summ.)

17955. Clady, Michael D. (Inst. for Fish. Res., Mich. Dept. of Nat. Resources, Ann Arbor, Michigan). 1974. FOOD HABITS OF YELLOW PERCH, SMALLMOUTH BASS AND LARGEMOUTH BASS IN TWO UNPRODUCTIVE LAKES IN NORTHERN MICHIGAN. Amer. Midl. Nat., 91(2): 453-459.

The food habits of 248 yellow perch (Perca flavescens), 479 smallmouth bass (Micropterus dolomieui) and 551 largemouth bass (M. salmoides) from two unproductive lakes are presented by size of the fish and month of capture. In all three species the young-of-the-year ate small entomostracans; older fish ate insects and fish. Scarcity of fish in the diets of young largemouth bass and juvenile and adult smallmouth bass undoubtedly contributed to the slow growth of these species. The phantom midge (Chaoborus) and chironomid midges were important as food for smallmouth bass of all sizes. Adult smallmouth bass and yellow perch and juvenile largemouth bass were especially cannibalistic. Adult largemouth bass and yellow perch usually fed on small yellow perch instead of on small largemouth bass. (Auth.)

17956. Hannesson, Rögnvaldur (Dept. of Economics, Univ. of Lund, Sweden). 1974. RELATION BETWEEN REPRODUCTIVE POTENTIAL AND SUSTAINED YIELD OF FISHERIES. J. Fish. Res. Board Can., 31(3): 359-362.

The steady-state yield curve is derived from the growth curve of biomass and shown to bend back toward the origin only if the relative growth rate of biomass is not a monotonically decreasing function of biomass. The bearing of this shape of the yield curve on the possibility of extinction of species is discussed. (Auth.)

17957. Baumann, Paul C., and James F. Kitchell (Lab. of Limnol., Univ. of Wisconsin-Madison, Madison, Wisconsin 53706). 1974. DIEL PATTERNS OF DISTRIBUTION AND FEEDING OF BLUEGILL (Lepomis macrochirus) IN LAKE WINGRA, WISCONSIN. Trans. Amer. Fish. Soc., 103(2): 255-260.

Bottom trawl samples showed that there were diel changes in bluegill abundance in limnetic areas of Lake Wingra, Wisconsin, from April to November 1970. Catches during daylight were greater than those at night. Sampling both littoral and limnetic habitats during September, when diel migrations appeared most dramatic, indicated that fish moved onshore after sunset and offshore after sunrise. All size classes sampled appeared to participate in these movements. Larger fish predominated in littoral areas, suggesting either longer residence time during a diel cycle or a proportionately larger resident population. Stomach analyses indicated that bluegills ate most zooplankton in limnetic areas, whereas macrofood organisms such as insects dominated the prey of littoral zone fish. Quantitative comparisons of stomach content demonstrated that smaller fish benefited most from the offshore migration. (Authors)

17958. Il'ina, L. K. (Inst. of the Biol. of Inland Waters, USSR Acad. of Sci., Borok, Yarslavl Province, USSR). 1973. THE BEHAVIOR OF PERCH (Perca fluviatilis L.) UNDERYEARLINGS OF DIFFERENT ECOLOGICAL GROUPS IN THE PROGENY OF A SINGLE PAIR OF SPAWNERS. J. Ichthyol., 13(2): 294-304.

In the rearing of juvenile perch (Perca fluviatilis L.) in ponds and live containers 3 ecological groups were obtained in the progeny of a single pair of spawners: predators, benthophages and plankton feeders. Consideration is given to the special features in the behavior of individuals of each group in the course of their growth over the summer. Remaining in the same body of water, these groups occupied separate ecological niches, which enables the species to make fuller use of the food resources of the environment.

17959. Schwanz-Pfitzner, Ingrid and Muhsin Özel (Inst. for Bacteriol., Berlin-Dahlem, Germany). 1973. ELECTRON MICROSCOPY STUDIES OF CELL CULTURES: DEMONSTRATION OF A MIXED INFECTION BY EGTVED VIRUS OF THE RAINBOW TROUT AND MYCOPLASMA (Acholeplasma laidlawii). Zbl. Bakt. Hyg., I. Abt. Orig. A 225:431-437; Fish Health News, 3(2): p. 10.

In ultra-thin sections of permanent cell cultures from cold-blooded animals (RTG-2, rainbow trout gonads), which have been exposed to a mixed infection, the simultaneous presence of virus (Egtved virus) and mycoplasma (Acholeplasma laidlawii) could be demonstrated by electron microscopy. With the aid of this technique, distinct changes in cells and phenomena of cell decay were observed in cases of infection by virus or mycoplasma alone and, with greater intensity, in cases of mixed infection by both agents. No statement can be given as yet with regard to a possible interaction between them. (Authors)

17960. Hawkins, A. D., D. N. MacLennan, G. G. Urquhart, and C. Robb (Mar. Lab., Torry, Aberdeen, Scotland). 1974. TRACKING COD Gadus morhua L. IN A SCOTTISH SEA LOCH. J. Fish Biol., 6(3): 225-236.

Equipment has been developed and used to follow the movements of free-swimming individual fish in the sea. A pulsed ultrasonic transmitter inserted into the stomach is tracked by measuring differences in the time of arrival of the acoustic pulses at an array of omnidirectional hydrophones. The method was used to plot the movements of cod in an enclosed sea-loch. After an initial phase of active movement the cod became less mobile and adopted a nocturnal cycle of activity. (Authors)

17961. Niimi, A. J., and F. W. H. Beamish (Dept. of Zool., Univ. of Guelph, Guelph, Ontario, Canada). 1974. BIOENERGETICS AND GROWTH OF LARGEMOUTH BASS (Micropterus salmoides) IN RELATION TO BODY WEIGHT AND TEMPERATURE. Can. J. Zool., 52(4): 447-456.

Changes in growth and proximate body composition of largemouth bass (Micropterus salmoides) were examined for fish of 8-150 g, between 18 and 30 C. For most weights, growth of fish (grams/day) was highest at 25 C, and lowest in fish at 18 C. This was attributable in part to a higher satiation (maximum) feeding level at 25 C. For a fixed level of feeding, growth rate (percentage wet weight/day) was highest for fish held at 18 C. Lipid content (percentage wet weight) increased with feeding level and was highest at 18 C. Moisture content varied inversely with lipid. Protein and ash content did not vary appreciably with temperature, body weight, or feeding level. Maintenance requirement of bass, expressed as grams/day, was about twice that lost during food deprivation, but only slightly different when expressed as kilocalories/day. Energy requirements for nonfecal losses were estimated as 10% of intake energy at all feeding levels. Standard metabolism accounted for 50% of intake energy near maintenance, but only 10% at the satiation feeding level. Growth requirements increased from zero at maintenance to 40% of intake energy at satiation feeding. (Authors)

17962. Hearne, J. S., and R. A. Pasco (Panama Canal Co., Balboa Heights, Canal Zone, USA). 1972. AQUATIC WEED CONTROL TRIALS, GATUN LAKE, PANAMA CANAL. Hyacinth Control Journal No. 10, pp. 33-35; Weed Abstracts, 23(4): abstract 620.

In 3 years' trials at Gatun Lake, dry season applications of copper sulphate at 5-10 ppmw., the liquid formulation of Hydrothol 191 (endothal [mono NN-dimethylalkylamine]) at 1-3 ppmw. and diquat ± copper sulphate each at 1, 1.5 and 2 ppmw. all controlled Hydrilla verticillata for a number of weeks, but diuron and granular Hydrothol 191 lacked adequate activity. Fish were sensitive to copper sulphate and, to a lesser extent, to Hydrothol 191, but tolerated diquat ± copper sulphate at the concentrations tested.

17963. Zambriborshch, F. S., and Nguen Tan Chin (The I.I. Mechnikov Univ., Odessa, USSR). 1973. THE DESCENT OF FISH LARVAE INTO THE SEA THROUGH THE KILIYA ARM OF THE DANUBE. J. Ichthyol., 13(1): 90-95.

The embankment of lowlying areas in the Danube delta has a detrimental effect on the survival of fish larvae and hastens their descent to the sea. It was established by research in 1969 and 1970 that shad larvae and the larvae of several freshwater fish are found in the river near the sea. In the course of two months in 1970 more than one billion larvae, including more than 300 million shad larvae in early stages of development drifted past the post at Vilkovo. Shad larvae perish in sea water. With rare exceptions, they are not found at the mouth of the river. Asp larvae rapidly perish in brackish water; they die within 53 minutes on average in salt water at a salinity of 16.3 ‰. As a consequence of the mortality of larvae of freshwater fish in the sea, very low catches of freshwater fish are observed in the lower reaches of the Danube and semidiadromous forms are absent. This should be taken into consideration when carrying out fisheries improvement works.

17964. Frame, David W. (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1974. FEEDING HABITS OF YOUNG WINTER FLOUNDER (Pseudopleuronectes americanus): PREY AVAILABILITY AND DIVERSITY. Trans. Amer. Fish. Soc., 103(2): 261-269.

The principal diet of age I+ winter flounder Pseudopleuronectes americanus captured in the Weweantic River Estuary, Wareham, Massachusetts was comprised of polychaetes, bivalves, gastropods, and crustaceans. During spring, flounder fed on planktonic crustaceans found within the estuary and during the summer and fall on mollusks and polychaetes at the estuary's mouth. A new technique, percent overlap, is described for the comparison of the volume precentages of food species in Peterson grabs and stomachs. Percent overlap values were progressively higher

with each season: March, 1.8%; June 29%; July, 47%; October, 47%. The low overlap values, occurring when fish were within the estuary, indicated that the benthic community was not an important food source. Diversity indices (Shannon-Weaver, Simpson and McIntosh) calculated for mollusks and macrocrustaceans were more variable at stations within the estuary than at the mouth. (Auth.)

17965. May, B. E., R. S. Hestand, J. M. Van Dyke (Fla. Game and Fresh Water Fish Comm., Fisheries Res. Lab., Eustis, Florida 32726). 1973. COMPARATIVE EFFECTS OF DIQUAT PLUS COPPER SULPHATE ON AQUATIC ORGANISMS. Weed Science, 21(3): 249-253; Weed Abstracts, 23(5): abstract 902.

The synergistic effect of 2 herbicide combinations on the macroinvertebrates in Inglis Reservoir, West Florida and the possible influence on fish diets were evaluated during 1970. The addition of diquat + the triethanolamine complex of copper sulphate (TAC) or diquat + copper sulphate pentahydrate (CSP) for control of hydrilla (Hydrilla verticillata) decreased the number of invertebrates inhabiting the treated areas. Diquat + CSP exerted the greatest effect upon invertebrate numbers but both herbicide combinations significantly altered the number of taxonomic groups in the areas. Invertebrate declines were due to resultant habitat changes such as loss of hydrilla rather than to direct herbicide toxicity. The response of fish to the effects of the herbicide treatments on invertebrates could be ascribed to diet changes, decreased growth rates and possible mortality. (From summ.)

17966. Whitt, G. S., E. T. Miller, and J. B. Shaklee. 1973. DEVELOPMENTAL AND BIOCHEMICAL GENETICS OF LACTATE DEHYDROGENASE ISOZYMES IN FISHES. Reprint from: Genetics and Mutagenesis of Fish, edited by J. H. Schröder, printed in Germany by Springer-Verlag, Berlin Heidelberg New York, not for sale, pp. 243-276.

17967. Burton, Dennis T., and Philip R. Abell (Acad. of Nat. Sciences of Philadelphia, Benedict Estuarine Lab., Benedict, Maryland 20612). 1973. INITIAL COMPENSATORY RESPONSES IN VENTILATION FREQUENCY OF THREE EURYTHERMAL ESTUARINE FISH EXPOSED TO A MODERATE TEMPERATURE INCREASE. Amer. Zool., 13(4): 1290.

In contrast to the numerous studies on effects of extreme temperature changes to fish, this study was designed to evaluate initial responses of eurythermal fish exposed to a moderate temperature increase. Trinectes maculatus, Morone americana and Leiostomus xanthurus were acclimated to 5°, 15° and 25°C and subjected to a 5°C increase over a 15-minute period. All fish were held at the elevated temperature for 24 hours. Changes in ventilation frequency were used as a secondary metabolic indicator to assess physiological adjustments to temperature. Ventilation rates increased concurrently as temperatures increased over the 15-minute period. Ventilation quickly stabilized at the higher rates and remained relatively constant throughout the 24 hours in all acclimation groups. Acclimated rate-temperature curves (R-T curves), which were used to compare these species in an ecologically meaningful way, showed that partial homeostatic compensation to temperature of Precht's adaptation type 3 (Q_{10} = 1.8-1.9) occurred in most cases. Two exceptions were found between 5° and 15°C where a type 4 adaptation (Q_{10} = 2.4) occurred in T. maculatus and a type 2 adaptation (Q_{10} - 0.9) was found in M. americana. Exposure to a 5°C increase was also assessed by superimposing acutely measured R-T curves on the same ordinates as the acclimated R-T curves. The slopes and Q_{10} values of the acutely measured R-T curves were less in all cases for T. maculatus; approximately the same for M. americana and greater for L. xanthurus. The acutely measured R-T curves demonstrate that there are species differences in response to a moderate temperature increase in the range of capacity adaptation as well as differences in the time course of adaptation to environmental change. (Authors)

17968. Cunningham, B. T. 1974. FISHERIES MANAGEMENT DIVISION PUBLICATIONS 1973. N. Z. Min. of Agric. and Fish., Fisheries Technical Report No. 129, 10 p., Wellington, New Zealand.

17969. Benville, Pete E., Jr. and Sid Korn (NMFS, Tiburon Fish. Lab., Tiburon, California 94920). 1974. A SIMPLE APPARATUS FOR METERING VOLATILE LIQUIDS INTO WATER. J. Fish. Res. Board Can., 31(3): 367-368.

A metering device was developed to introduce benzene, toluene, xylene, and 1, 2, 4 trimethylbenzene vapors into water using air as a carrier gas. Settling the carrier gas flows for the respective aromatics at 10, 25, 120, and 500 cm^3/min for 2 h resulted in concentrations of 8.2, 13.0, 12.0, and 7.2 µl/liter, respectively, in 4 liters of water. The aromatic concentrations were maintained in a static system by bubbling air through the water, and in a continuous flow system by replenishing the water. In static systems the respective aromatic concentrations were maintained for 4 days within the ranges of 13-14, 5.1-7.0, 0.40-0.50, and 0.018-0.028 µl/liter by bubbling the aromatics into the water at 5 cm^3/min and independently aerating the water at 100 cm^3/min. In a 14-day continuous flow system benzene concentrations ranged from 2.1-2.8 µl/liter when benzene was bubbling at 23 cm^3/min and water was flowing at 1.8 liters/min. (Authors)

17970. Zakharchenko, G. M. (Pechora-Ilych State Reservation, Settlement of Yaksha, Troitsko-Pechersk District, USSR). 1973. THE FEEDING OF THE BURBOT [Lota lota (L.)] IN THE UPPER REACHES OF THE PECHORA. J. Ichthyol., 13(2): 310-312.

The results of the analysis of stomach contents show that the burbot is an omnivorous fish in the region covered by the investigations. Invertebrates are frequently found in the stomach, although fish take first place in terms of weight and cyclostomes and amphibians play a secondary role. In our material we found nine species of fish consumed as food by the burbot to varying degrees. The composition of the food of the burbot in the three regions investigated is slightly different, but the items most frequently and ubiquitously encountered in burbot stomachs are the minnow [Phoxinus phoxinus (L.)], the sculpin (Cottus gobio L.) and invertebrates. Juvenile Atlantic salmon are not a principal food item of the burbot. Their frequency of occurrence in stomachs was 1.0% in the region of the Shizhim Pechorskiy cordon and 0.6% in the region of the village of Pachgino; no juvenile salmon were recorded in the region of the settlement of Yaksha. These data evidently indicate that the burbot cannot appreciably influence the abundance of juvenile salmon, which are a chance item in its food.

17971. Shul'man, S. S. 1966. MYXOSPORIDIA AS AGENTS OF FISH DISEASES. In: Miksosporidii Fauny SSSR Izdatel'stvo "Nauka", Moskva- Leningrad, pp. 413-437, translated by R. M. Howland for U.S. Fish and Wildlife Service; Fish Health News, 3(2): p. 11, 1974.

This chapter, Myxosporidia as Agents of Fish Diseases, includes sections entitled (1) The pathogenic influence of Myxosporidia, (2) Basic methods of control of Myxosporidia, and (3) The most dangerous Myxosporidioses of Fish in Waters of the USSR. The latter is further sub-titled: Gill diesases, Boil and ulcer diseases, Icteric diseases, Eye diseases, Malignant anemia, Whirling diseases of salmonids, and Ovarian diseases. This translation includes pathogenesis, control, and treatment of the most important myxosporidan diseases of the USSR. -- G. L. Hoffman

17972. Otto, Robert G. (Dept. of Zoology, Arizona State Univ., Tempe, Arizona 85281). 1974. THE EFFECTS OF ACCLIMATION TO CYCLIC THERMAL REGIMES ON HEAT TOLERANCE OF THE WESTERN MOSQUITOFISH. Trans. Amer. Fish. Soc., 103(2): 331-335.

Tests were conducted to determine the upper incipient lethal temperature and critical thermal maximum (CTM) for mosquitofish acclimated to 25.0 C and 35.0 C, the effects of various cyclic thermal acclimation regimes on the CTM, and the effects of severe daily heat stress on the CTM. Heat tolerance of mosquitofish subjected to brief daily exposure to temperatures approximating or exceeding the upper lethal limit was increased over that obtained with constant temperature acclimation in proportion to the peak temperature of the cycle. (Auth.)

17973. Mann, R. H. K. (Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset, England). 1974. OBSERVATIONS ON THE AGE, GROWTH, REPRODUCTION AND FOOD OF THE DACE, Leuciscus leuciscus (L.), IN TWO RIVERS IN SOUTHERN ENGLAND. J. Fish Biol., 6(3): 237-253.

Scales of 497 dace from the river Stour and 573 from the river Frome were used for age determinations. Annuli were laid down in late May to early June at the start of the growth period. Minimal growth occurred from November to April. Male dace grew minimally faster than females; Frome dace faster than those from the Stour. Growth rates in the two rivers were similar to those published for most other European waters. Variation in growth rates in different years was not great, but there were marked differences in recruitment success. Spawning occurred in the second half of March and elaboration of the gonads between September and March. Immature dace have an annual cycle in condition with a maximum in June and a minimum during the winter months. The condition of the mature females is affected by the gonad cycle. The fecundity of Stour dace is represented by the formula: log egg number = 4.038 log length (mm)-5.474 and for Frome dace by: log egg number = 3.900 log length (mm)-5.128. Most dace were mature by age IV, but there more mature II and III group fish in the Frome population. Molluscs and Trichoptera larvae comprised the bulk of the winter diet of Stour dace, and Ephemeroptera nymphs, Simulium and chironomid larvae were the principal constituents during the summer. (Auth.)

17974. Graynoth, E., and W. Skrzynski. 1974. THE NORTH CANTERBURY TROUT AND SALMON FISHERY. N. Z. Min. of Agric. and Fish., Fisheries Technical Report No. 120, 30 p., Wellington, New Zealand.

This report describes the trout fisheries of the West Coast and Westland Acclimatisation Districts. It is based on angling results collected since 1949 in six angling diary schemes. In the West Coast Acclimatisation District license sales have been stable for over 15 years. The average men's whole season license holder fishes for approximately fourteen days to catch about twelve fish per season, the total district catch of approximately 15,000 fish being caught in 18,000 days angling. In the Westland Acclimatisation District license sales are fairly low but are still increasing. The average men's whole season license holder fishes for about eleven days to catch seven fish per season. The total district catch is between 3-1/2 and 7,000 fish per season and the total effort between 5,500 and 11,000 days. Brown trout are the principal species caught, rainbow trout populations being found in some lakes and headwaters of a few rivers. Lake Mapourika contains a stock of landlocked quinnat salmon. The trout average between 0.9 and 1.2 kilograms (kg) in weight and have remained stable in size for many years. No surveys of the fish stocks have been carried out but it is thought that the anglers' crop is a small proportion of the stock. The thirty principal waters and anglers' catches are described. The fisheries regulations are lenient but there is a lack of scientific information on the fisheries. Without this information, management will continue to be somewhat speculative. (Authors' summ.)

17975. Targett, Timothy E., and James D. McCleave (Dept. of Zool., Univ. of Maine, Orono, Maine 04473). 1974. SUMMER ABUNDANCE OF FISHES IN A MAINE TIDAL COVE WITH SPECIAL REFERENCE TO TEMPERATURE. Trans. Amer. Fish. Soc., 103(2): 325-330.

The daytime abundance and localized distribution of fishes in relation to temperature were studied in a small tidal cove by beach seining on seven dates in the Back River estuary, Maine, during the summers of 1971 and 1972. Temperatures on the seven dates ranged from 15.1-26.2 C and salinities ranged from 17.3-24.7 °/oo . Eighteen species of fishes were captured, with mummichogs, smooth flounders, Atlantic silversides and Atlantic herring together comprising over 98% of the catch. Mummichogs and Atlantic silversides were captured primarily near the inner end of the cove, while other abundant species were caught mainly at the outer end of the cove. Several species seem well adapted to naturally warm cove temperatures. Others seem now virtually excluded because of warm temperatures. Winter flounder, Atlantic herring, and Atlantic tomcod might be excluded from the cove during daytime in summer if artificial warming of the cove were permitted. (Authors)

17976. Lin, C. K., A. J. Nemo, and D. L. Vedder (Applied Biochemists, Inc., Mequon, Wisconsin 53902). 1972. COPPER RESIDUE IN RAINBOW TROUT. Hyacinth Control Journal, Vol. 10, pp. 43-44; Weed Abstracts, 23(2): abstract No. 358, 1974.

In trials in which rainbow trout (Salmo gairdneri) were exposed to copper at 0.125 to 8 ppmw. as solutions of copper sulphate pentahydrate and Cutrine (copper triethanolamine) for 24- to 96-h periods, average Cu residues detected in the fish were 3.9 and 4.5 ppmw., respectively, compared to 2.8 ppmw. for controls. No relationship between Cu residues and exposure time was evident. Fish exposed to >1 ppmw. Cu for 24 h showed acute toxicity, though the high alkalinity and hardness of the spring water used in the studies probably favoured survival in relatively high Cu concentrations.

17977. Mina, M. V. (Dept. of Ichthyol., Moscow Univ., Moscow, USSR). 1973. A MEANS OF OBTAINING UNBIASED AND ACCURATE ESTIMATES OF THE AGE OF FISH, WITH SPECIAL REFERENCE TO THE "MIKHIZA" (Salmo mykiss Walbaum) OF THE KAMCHATKA RIVER. J. Ichthyol., 13(1): 96-103.

Polymodal curves characterizing the size of a structure under investigation at the time of formation of zones taken to be annual zones may be used in determination of the age of fish from recording structures (from otoliths in the example considered of the "mikhiza" (Salmo mykiss Walb.). The use of such curves helps to increase the reproducibility of age estimates of the same fish obtained by different workers and makes it possible to establish the nature of the mistakes most frequently made in the simple counting of zones.

17978. Trotzky, Howard M., and Richard W. Gregory (Maine Coop. Fish. Unit, Univ. of Maine, Orono, Maine 04473). 1974. THE EFFECTS OF WATER FLOW MANIPULATION BELOW A HYDROELECTRIC POWER DAM ON THE BOTTOM FAUNA OF THE UPPER KENNEBEC RIVER, MAINE. Trans. Amer. Fish. Soc., 103(2): 318-324.

We studied the effect of severe fluctuations in flow on the distribution of bottom fauna of the upper Kennebec River. During the years 1964-1970, discharges below Wyman Dam ranged from 8.5 m^3/sec to an average daily high of about 170 m^3/sec. Slow currents resulting from low flows appeared to limit the diversity and abundance of swift-water aquatic insects on the river-bottom below the dam. Sampling stations above the impoundment averaged 19 aquatic insect genera, while those below the dam averaged 11. About 19 genera were found at stations where the current near bottom fluctuated from 0.5 m/sec to 0.9 m/sec while only 4 genera were found at stations where the fluctuations were from 0.1 to 0.5 m/sec. Aquatic insects adapted for swift water such as Rhyacophila, Chimarra, Iron, Blepharocera, Acroneuria, and Paragnetina were more abundant above the impoundment than below, and were absent from those stations below the impoundment with the lowest current velocities. (Authors)

17979. McKenzie, J. A. (Dept. of Zool., Univ. of Western Ontario, London, Ontario, Canada). 1974. THE PARENTAL BEHAVIOR OF THE MALE BROOK STICKLEBACK Culaea inconstans (Kirtland). Can. J. Zool., 52(5): 649-652.

The parental behavior of the brook stickleback, Culaea inconstans, is similar to that described for other species of sticklebacks. The male aerates the developing embryos by fanning a current of water over the eggs. The amount of time spent fanning is low for the first 3 or 4 days. It then increases rapidly until the embryos hatch. A nursery helps to entangle the young for a few days before they become free-swimming. Time to hatching is dependent upon water temperature. Some males were seen building new nests by pulling apart the old one, and then transferring the eggs from the old to the new nest. Males were observed stealing eggs from nests other than their own. (Auth.)

17980. Armstrong, F. A. J., and A. L. Hamilton (Fish. Res. Board of Can., Freshwater Inst., Winnipeg, Manitoba, Canada). 1973. PATHWAYS OF MERCURY IN A POLLUTED NORTHWESTERN ONTARIO LAKE. Trace Metals and Metal-organic Interactions in Natural Waters, pp. 131-156, Ann Arbor Science Publishers.

17981. Taub, S. H., C. F. Clark, D. A. Mayhew, and J. B. Lisiecki. 1974. SUITABILITY OF OHIO INTERSTATE HIGHWAY BORROW PIT PONDS FOR SPORT FISHING. Ohio Agric. Res. and Development Center Research Bulletin 1064, Wooster, Ohio, 21 p.

An investigation was conducted to determine the number, distribution, and size of Ohio Interstate Highway borrow pit ponds; and to measure biological, chemical, and physical characteristics of eleven of these ponds selected at random pertinent to an evaluation of their sport fishing potential. Information gathered on construction and economic considerations was used to predict additional construction costs of an "ideal" borrow pit pond. Based on plankton, benthos, and fish biomass, the ponds exhibited a variety of trophic conditions ranging from unproductive to eutrophic. The more productive ponds had connections to external nutrient sources. A careful plan of fertilization is suggested for infertile borrow pit ponds. Fish populations were largely out of balance due to owner mismanagement. As of July 1970, 211 borrow pit ponds impounding 1280 surface acres existed adjacent to interstate highways (exclusive of I-90). Greatest concentrations were in western and northern Ohio. Analysis of construction methods and costs revealed that design features for optimum fish production could be incorporated into new ponds for less than $5,000 per surface acre. (Authors)

17982. Freeman, H. C., D. A. Horne, B. McTague, and M. McMenemy (Dept. of the Environ., Fish. and Mar. Serv., Halifax Lab., Halifax, Nova Scotia, Canada). 1974. MERCURY IN SOME CANADIAN ATLANTIC COAST FISH AND SHELLFISH. J. Fish. Res. Board Can., 31(3): 369-372.

All species of North Atlantic fishes studied, with the exception of two groups of offshore lobsters, had total mercury levels less than the 0.5 ppm limit allowed for fish of commerce in Canada and the United States. There appeared to be no relationship between mercury levels and the sex and/or weight of fish of any one species. The first indication that mercury was a threat to public health came from the Japanese mercury poisoning epidemics in the early 1950s (Löfroth 1969; Berglund et al. 1971). This initiated many studies. Apparently increased industrial and agricultural use and the broad dissemination of mercury compounds had caused mercury contamination in fish (Nuorteva 1971). (Authors)

17983. Jacobsen, Theodore V., and Roger W. Bachmann (Iowa State Univ., Ames, Iowa 50010). 1974. CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA. Iowa State Journal of Research, 48(4): 285-290.

A 16-year series of daily water temperature readings from the Clear Lake Water Treatment Plant was used to develop a regression equation for the calculation of lake water temperatures during the ice-free portion of the year. Daily maximum and minimum air temperatures from a local observation station were used as the independent variables. The relationship that gave the minimum standard deviation from regression was $Y = 1.40 + 0.980\ X$, where Y is the estimated water temperature (C°) on a given day and X is the average of the maximum plus minimum daily air temperatures (C°) on that day and the previous 9 days. Daily water temperatures can be calculated with a standard deviation of 1.84 C by use of the equation. Similar relationships were developed for Oneida Lake, New York, Lake Maxinkuckee, Indiana, and Big Spirit Lake. (Authors)

17984. Casselman, John M. (Dept. of Zool., Univ. of Toronto, Toronto, Ontario, Canada M5S 1A1). 1974. EXTERNAL SEX DETERMINATION OF NORTHERN PIKE, Esox lucius Linnaeus. Trans. Amer. Fish. Soc., 103(2): 343-347.

Northern pike, Esox lucius Linnaeus, collected from two regions in Ontario from 1961 to 1969, were studied to determine what characteristics and procedures might be used to externally separate the sexes. Spontaneous passage of reproductive products from the urogenital pore is the most accurate indicator of sex but can be used to differentiate such a small percentage of individuals annually that its value is limited. Even when stripped during the spawning period, only 82% of the mature males and 76% of the mature females yielded reproductive material. Differential body form alone is not a satisfactory indicator of sex. Sexing northern pike by the external appearance of the urogenital region is described. This technique can be

applied to both mature and immature northern pike regardless of season. Accuracy of the method was tested throughout the year. Monthly averages of autopsied mature fish revealed that the urogenital technique was used to correctly sex 91% of the males and 94% of the females. (Auth.)

17985. Abel, P. D. (Dept. of Biol. Sci., Univ. of Aston in Birmingham, Gosta Green, Birmingham B4 7ET, England). 1974. TOXICITY OF SYNTHETIC DETERGENTS TO FISH AND AQUATIC INVERTEBRATES. J. Fish Biol., 6(3): 279-298.

Synthetic detergents are reported to be acutely toxic to fish in concentrations between 0.4 and 40 mg/l. Factors affecting toxicity include the molecular structure of the detergent, water hardness, temperature and dissolved oxygen concentration; the age and species of the test fish, and acclimation to low concentrations of detergent. Some of these factors appear to be of only limited importance. Gill damage is the most obvious acute toxic effect; the immediate cause of death may be asphyxiation, but detergents may also be toxic internally. Lethal effects not related to gill damage have not been investigated. Sublethal effects include retardation of growth, alteration of feeding behaviour and inhibition of chemo-receptor organs. Low levels of detergents may also increase the uptake of other pollutants. Invertebrates, expecially in their juvenile stages, are extremely sensitive to detergents: concentrations below 0.1 mg/l interfere with growth and development in some species. The interactions between detergents and proteins, and their influence on membrane permeability may be the basis of the biological action of detergents. Detergents in natural waters are usually partially degraded, and a maximum permissible concentration of 0.5 mg/l would probably be harmless under most conditions. (Auth.)

17986. Hoa, Don Thi Le (A. N. Severtsov Inst. of Evol. Morph. and Animal Ecol. (IEMEZh), USSR Acad. of Sciences, Moscow, USSR). 1973. VARIABILITY OF JUVENILE GRASS CARP [Ctenopharyngodon idella (Val.)] AND POND CARP [Cyprinus carpio (L.)] REARED AT A HATCHERY IN THE SOUTHERN UKRAINE. J. Ichthyol., 13(2): 305-309.

Juvenile pond carp obtained from eggs from natural spawning and reared in a growth pond to which silkworm pupae were added as supplementary food reached a weight of 17.2 g in 2-1/2 months. Retardation of growth was observed from the end of June until the middle of July. Juvenile carp obtained from eggs which had been incubated in the adhesive state in Sadov-Kokhanskaya apparatuses reached a weight of 10.6 g over the same period when reared in a small experimental pond on natural food alone. In connection with the lack of food the growth rate of the young declined continuously, to reach a minimum at the end of the summer. Despite this, the young obtained were fully viable and in no way inferior to the young obtained from natural spawning with respect to condition factor and relative length of the intestine. Retardation in the growth of the juvenile fish was accompanied by an increase in their size and weight variability and by an increase in the positive skewness of the distribution of the fish by size-weight classes. This proves that the variability indicators, especially the coefficient of skewness, may serve as a reliable criterion for estimates of the living conditions and biological state of juvenile fish in hatcheries in which a complete record of the results of rearing (in terms of survival rate, mean weight and fish productivity) is often difficult. In a period of deteriorating conditions and retardation of growth the relative length of the intestine of juvenile grass carp and pond carp may be appreciably reduced.

17987. Speir, Jon A., and N. H. Anderson (Dept. of Entomol., Oregon State Univ., Corvallis, Oregon). 1974. USE OF EMERGENCE DATA FOR ESTIMATING ANNUAL PRODUCTION OF AQUATIC INSECTS. Limnology and Oceanography, 19(1): 154-156.

Use of emergence data for aquatic insects is proposed as an indirect method of estimating production rate. Concurrent production and emergence estimates are compared for four species of black flies (Diptera: Simuliidae). The pooled production: emergence ratios for all four species were 4.3 in 1971 and 4.8 in 1972. (Authors)

17988. Tesarcik, J. 1972. CONTROL OF IMAGOES AND EGGS OF THE sialid Sialis flavilatera L. BY SOME CHEMICAL AGENTS. Acta Vet. Brno, 41:401-404; (Res. Inst. Piscicult. and Hydrobiol., Czech Agr. Acad., Vodnany, Res. Station Ostrava); Fish Health News, 3(2): p. 11, 1974.

This paper is the contribution to the possibility to break the development cycle of the intestinal worm Neoechinorhynchus rutili by means of reducing the abundance of the sialid Sialis flavilatera L. intermediate hosts in the menaced ponds. Laboratory experiments were carried out in May and June 1967; owing to the finding of an economically more advantageous method of breaking the development cycle of the parasite by dehelminthization of the infected carps by Tetrafinol, the laboratory experiments have not been worked out as far as the working application stage. To control the imagoes of the intermediate hosts of the intestinal worm N. rutili - Sialis flavilatera L. in the laboratory conditions we tried three agents (Dalapon, Slovasol O and Dykol) and one combination of them (Dalapon with Slovasol O). Of these agents Dykol showed to be the most effective. We found Slovasol O more effective for the control of Sialis flavilatera eggs after their submerging into solution than 1% Dykol solution. The 10% solution of $CuSO_4$ and the chlorseptol solution of the same concentration after 5-minute expiration time showed to be ineffective. (Auth.)

17989. Lyakhnovich, V. P., T. I. Nekhayeva, and T. M. Shevtsova (Dept. of Zool. and Parasitol., Byelorussian Acad. of Sciences, Minsk, USSR). 1973. EFFECTIVENESS OF THE UTILIZATION OF FOOD RESOURCES BY FOOD FISH IN BODIES OF WATER IN THE BYELORUSSIAN FOREST REGION (POLES'YE). J. Ichthyol., 13(1): 112-120.

Stocks of food fish in the Pripyat' and Goryn' rivers and in Lakes Vygonovskoye and Bobrovichskoye have been calculated from the rate of exploitation and the size of the catches. The food requirements of the main commercially exploited species and of the whole of the commercially exploited fish stock were determined from the rate of weight increase, the metabolic rate and the composition of the contents of fish intestines. These data are compared with the natural food resources of zooplankton and benthos in the bodies of the water investigated.

17990. Milbrink, Göran, and Torgny Wiederholm (Inst. of Freshwater Research, Drottningholm, Sweden). 1973. SAMPLING EFFICIENCY OF FOUR TYPES OF MUD BOTTOM SAMPLER. Oikos, 24(3): 479-482.

Results of tests comparing the sampling efficiency of two box samplers (Ekman type) and two tube samplers commonly used on mud bottoms in freshwater, i. e. a standard Ekman sampler, a modified Ekman sampler, a compound sampler and a commercial version of a single corer, are presented. Tests are focused on the efficiency of sampling chironomid larvae, these larvae being a major component of the bottom fauna in the area selected for the study. No sampler was found to diverge from the others to any great extent. However, statistical tests proved the standard Ekman and the multiple corer to be slightly more effective than the other two. (Authors)

17991. Robinson, Henry W. (Dept. of Biol. Sci., Southern State Coll., Magnolia, Arkansas). 1974. AN ADDITIONAL POPULATION OF Etheostoma pallididorsum Distler and Metcalf IN ARKANSAS. Amer. Midl. Nat., 91(2): 478-479.

Recent collecting in central Arkansas has revealed a previously unknown population of Etheostoma pallididorsum which was heretofore thought to be endemic to the headwaters of the Caddo River. The population was found in the Ouachita River drainage NE of the Caddo River population. (Auth.)

17992. Meshcheryakov, A. I., and N. Kh. Bikbaev (Administration "Sevkasprybvod"). 1973. AN APPARATUS FOR DEGUMMING AND WASHING FISH SPAWN (Apparat dlya obeskleivaniya i otmyvki ikry ryb). Rybnoe Khozyaĭstvo No. 12, pp. 15-17. In Russian.

An apparatus is described which can be utilized for degumming and washing the spawn of acipenserids, coregonids and salmonids. It operates with the help of compressed air and water.

17993. Greer, G. L., and D. R. Gardner (Dept. of Biol., Carleton Univ., Ottawa, Ontario, Canada). 1974. CHARACTERIZATION OF RESPONSES FROM TEMPERATURE-SENSITIVE UNITS IN TROUT BRAIN. Comp. Biochem. Physiol., 48(1A): 189-203.

Temperature-sensitive units in the trout brain were recorded extracellularly with microelectrodes. Twenty-five units that responded to changes in brain temperature were characterized on the basis of the time course of their response to prolonged elevated brain temperatures, and by plots of activity vs temperature change. The response of twelve of the warm-sensitive units appeared to adapt to the elevated brain temperature. The activity vs temperature response curves of three units were linear. The response curves of the other units were non-linear. They were classified into six types. The response curves of warm-sensitive units from trout resemble response curves of units in endotherms. (Authors)

17994. Carpenter, George F. (Dept. of the Environ. Fish. and Mar. Serv., Great Lakes Biolimnol. Lab., Can. Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. A PROPOSED METHOD SUITABLE FOR LARGE-SCALE SURVEYS OF BIOMASS IN LAKES. J. Fish. Res. Board Can., 31(3): 327-328.

A method for studying plankton biomass by comparing the results between planktonnet hauls and an integrated water column sample is described. Filtering the planktonnet sample through glass-fiber filter papers would yield planktonnet phytoplankton plus zooplankton biomass. Filtering the integrator sample would yield total phytoplankton biomass. Sieving part of this sample would give direct estimates of net and nannophytoplankton which could be used in combination with the values of net plankton biomass to give estimates of total biomass and zooplankton biomass. Ash-free dry weight is recommended instead of dry weight biomass. The results are easy to produce, are comparable with other parameters such as particulate carbon and nitrogen, and are in units which may be used in the determination of trophic status or nutrient budgets for a lake. (Auth.)

17995. Kissil, George William (Univ. of Conn., Mar. Res. Lab., Noank, Connecticut 06340). 1974. SPAWNING OF THE ANADROMOUS ALEWIFE, Alosa pseudoharengus, IN BRIDE LAKE, CONNECTICUT. Trans. Amer. Fish. Soc., 103(2): 312-317.

During 1966 and 1967, the spawning runs of an anadromous population of alewives, Alosa pseudoharengus (Wilson), were studied in Bride Lake, Connecticut. Alewives entered the lake from Long Island via Bride Brook from March to June. The number of fish entering the lake each day varied and was not related to water temperature or amount of moonlight. Males predominated among early migrants, whereas a 1:1 sex ratio existed through the later part of the migration. The average size of adults decreased as the migration progressed. Adults spent from several days to 3 months on the spawning grounds, the males outnumbering the females. Counts of the number of fish entering and leaving the lake indicated that high mortalities occurred. Females spawned from 48,000-360,000 eggs. The total number of eggs spawned in the lake was estimated to be 2.0×10^{10}. Young alewives migrated seaward from June to October and increased water flow was thought to be a major stimulant. One young alewife migrated seaward for every 80,000 eggs spawned, i.e., a 99.9987% freshwater mortality of eggs and young occurred. The ratio of young fish produced to the number of females spawning in the lake was 2.88:1. (Auth.)

17996. Shapley, D. 1973. HERBICIDES: AAAS STUDY FINDS DIOXIN IN VIETNAMESE FISH. Science, 180(4083): 285-286; Weed Abstracts, 23(5): 101, abstract 912.

Preliminary investigations on dioxin levels in South Vietnamese foodstuffs revealed an average of 540 parts per trillion (ranging from 18-814 parts per trillion) in fish and shellfish bought at 4 markets near Saigon in 1970. The source of dioxin has not been established but is considered to be Agent Orange [2, 4-D + 2, 4, 5-T], the principal herbicide used in this area between 1962 and '70.

17997. McCauley, Victor J. E., and Kanji Tsumura (Inst. of Resource Ecol., Univ. of Br. Columbia, Vancouver, British Columbia, Canada). 1974. CALORIFIC VALUES OF CHIRONOMIDAE (DIPTERA). Can. J. Zool., 52(5): 581-586.

Calorific determinations were made on the larvae of 9 species, and on the pupae and adults of 10 species, of Chironomidae from Marion Lake, British Columbia. Combination of these data with those in the literature to obtain mean calorific values (± 2 SE) for chironomid larvae, pupae, and adults gave values of 4802 ± 165 g-cal/g dry wt. and 5104 ± 178 g-cal/g ash-free dry wt., 4828 ± 136 g-cal/g dry wt. and 4975 ± 129 g-cal/g ash-free dry wt., and 4957 ± 78 g-cal/g dry wt. and 5019 ± 72 g-cal/g ash-free dry wt., respectively. (Authors)

17998. Harris, Martyn T., and Alwyne Wheeler (Dept. of Zool., British Museum (Nat. Hist.), London, England). Ligula INFESTATION OF BLEAK Alburnus alburnus (L.) IN THE TIDAL THAMES. J. Fish Biol., 6(2): 181-188.

Heavy infestations of the cestode Ligula are reported in bleak Alburnus alburnus (L.) from the tidal Thames. This parasite has not apparently been recorded previously from this host in the British Isles. The life cycle of the parasite is briefly summarized. Data on this infestation suggest an increase in the incidence of infestation up to a maximum in young bleak, followed by a decrease in older fish. There also appears to be a decrease from summer to autumn. The positive relationship between the weight of the parasite and the length of the host is discussed. Observations are made on the effect of Ligula on its host; it is suggested that many of the young bleak die during the autumn and winter, following their infestation. (Authors)

17999. Jones, John R., David M. Coon, and Roger W. Bachmann. 1974. LIMNOLOGICAL AND FISHERIES SURVEY OF THE UPPER SKUNK RIVER, IOWA. Iowa State Journal of Research, 48(3): 255-266.

In 1970, water-quality data and fish samples were collected from stations along a 50 km reach of the Skunk River near Ames, Iowa. High levels of plant nutrients and planktonic chlorophylls were found. Treated sewage effluents introduced at Story City and Ames produced measurable changes in several chemical parameters. Fewer fish species were found than had been reported in 1892. Present distributions were correlated with the geological structure of the stream channel. The greatest diversity of fish species was upstream from Ames, where the bedrock is close to the surface, forming a heterogeneous streambed of pools and riffles. In the southern part of this reach a low-diversity ichthyofauna dominated by carp was found in a more homogeneous substrate of shifting sand. These geological factors seemed more important in determining fish distributions along the river than did the observed water-quality differences. (Authors)

18000. Tu, Kuen-Ching, Rex S. Spendlove, and Ron W. Goede (Dept. of Bact. and Public Health, Utah State Univ., Logan, Utah). 1974. IMMUNOFLUORESCENT CELL ASSAY OF INFECTIOUS PANCREATIC NECROSIS VIRUS. Applied Microbiology, 27(3): 593-599.

An immunofluorescent cell (IFC) assay technique was developed for the quantification of infectious pancreatic necrosis (IPN) virus of salmonid fishes. Cover slip cultures of rainbow trout gonad (RTG-2) cells were infected with diluted virus preparations. After incubation to permit antigen development, the cells were stained with antiviral fluorescent antibody, and the number of fluorescing (infected) cells was counted. Optimal conditions for the IFC assay procedure are: (i) the use of RTG-2 cells cultured for at least 3 days at 20 C; (ii) 1-h absorption of IPN virus to RTG-2 cells at 20 C or alternatively, 4 h at 4 C; (iii) staining the infected cell cultures at 10 to 12 h postinfection. A linear relationship between the relative concentration of virus in the inoculum and the number of fluorescent cells in the first cycle of infection was observed. The IFC assay method is more sensitive than the plaque method for the assay of IPN virus. (Authors)

18001. Arnott, H. J., A. C. G. Best, S. Ito and J. A. C. Nicol (Dept. of Biol., Univ. of S. Florida, Tampa, Florida). 1974. STUDIES ON THE EYES OF CATFISHES WITH SPECIAL REFERENCE TO THE TAPETUM LUCIDUM. Proc. R. Soc. Lond., 186(1082): 13-36.

18002. Ikeda, Yayoi, Hisao Ozaki, and Yasuharu Sekizawa (Radioisotope Res. Lab., Tokyo Univ. of Fish., Konan 4, Minato-ku, Tokyo, Japan). 1974. ABSORPTION, DISTRIBUTION AND EXCRETION OF ^{3}H·2-AMINO-4-PHENYL-THIAZOLE, A PISCINE ANESTHETIC, IN CARP AND CRUCIAN CARP. Bull. Jap. Soc. Sci. Fish., 40(4): 339-350. In English.

A preliminary survey for the absorption, distribution and excretion of ^{3}H·2-amino-4-phenylthiazole was carried out to determine its anesthetic property, metabolism and residue. To observe the absorption and distribution, the fishes were immersed in fresh water containing 40 ppm of ^{3}H·2-amino-4-phenylthiazole hydrobromide for 60 min at 12°C. Also to observe the excretion, after immersion for 5 min, the fishes were moved into fresh water and the time course survey was continued for 3 hr. A tendency to give rise to a similar absorption or distribution pattern was observed in the hepatopancreas, spleen, kidney, muscle and gonad. Major distribution was, however, found in the brain. The order of distribution in each part of the brain was: medulla oblongata $\geqslant$ interbrain $\doteqdot$ midbrain $>$ cerebellum $\doteqdot$ spinal cord $>$ cerebrum. The critical concentration of this compound in the brain for the initiation of anesthetization was roughly estimated to be 70 μg eq./g wet brain. A tendency to give rise to a similar excretion pattern was observed in the blood and brain as a pattern for rapid excretion. In the hepatopancreas, kidney and spleen, after starting of the recovery process, the distribution of this compound was once augmented and then excreted. The major route of absorption or excretion was the gills, while a minor role was played in the bile and urine. (Authors)

18003. Allen, Herbert E. (U. S. Fish & Wildlife Service, Great Lakes Fish. Lab., Ann Arbor, Michigan 48107). 1973. SEASONAL VARIATION OF NITROGEN, PHOSPHORUS, AND CHLOROPHYLL a IN LAKE MICHIGAN AND GREEN BAY, 1965. Tech. Papers of the Bur. Sport Fish.and Wildl., No. 70, 23 p.

Total and dissolved phosphorus, nitrate, and chlorophyll a were measured at four stations in northern Lake Michigan (inshore Michigan, offshore Michigan, offshore Wisconsin, and inshore Wisconsin) and one station in southern Green Bay during 16 sampling periods in 1965. The nutrients were measured at depths of 2, 5, and 10 meters and chlorophyll a at 2 meters. In Green Bay total phosphorus (33.7 ppb) was about five times as high and dissolved phosphorus (7.0 ppb) more than twice as high as the averages for the four Lake Michigan stations, but nitrate nitrogen concentration (37.3 ppb) was only about one-third that in the lake. Total and dissolved phosphorus were about 50 percent higher in the inshore Michigan area than in the other three lake areas. Concentration and seasonal trends in nitrates differed relatively little among the four lake stations. Nitrate at all areas and depths sampled decreased to almost nondetectable levels during September. Chlorophyll a was 70 percent higher at the two inshore areas than at the two offshore areas in the lake and was more than four times higher in Green Bay than at any lake area. (Auth.)

18004. Wheat, Thomas E., William F. Childers, and Gregory S. Whitt (Dept. of Zool., Univ. of Ill., Urbana, Illinois). 1974. BIOCHEMICAL GENETICS OF HYBRID SUNFISH: DIFFERENTIAL SURVIVAL OF HETEROZYGOTES. Biochem. Genet., 11(3): 205-219.

Allelic segregation in reciprocal backcrosses involving the largemouth bass (Micropterus salmoides) and the F_1 hybrid (largemouth bass X smallmouth bass, M. dolomieui) was investigated to determine the extent of euheterosis and luxuriance. The frequencies of allelic isozymes encoded in the lactate dehydrogenase E, malate dehydrogenase B, and isocitrate dehydrogenase loci were determined for reciprocal backcross progeny subjected to different selection pressures. The progeny of the backcross (male F_1 X female largemouth bass) underwent a rapid loss of heterozygous individuals in a natural pond environment. When the offspring of this same mating were placed in artificial pools, where cannibalism is the main source of mortality, heterozygosity was advantageous. There was a marked correlation of increased heterozygosity at these enzyme loci with an increased growth rate. None of the above responses to selection was observed when the F_1 hybrid served as the maternal parent in the reciprocal backcross. A maternal factor in the egg cytoplasm may influence the expression of heterosis. (Authors)

18005. Parsons, John W. (Great Lakes Fish. Lab., U. S. Fish & Wildl. Serv., Ann Arbor, Michigan 48107). 1973. HISTORY OF SALMON IN THE GREAT LAKES, 1850-1970. Tech. Papers of the Bur. of Sport Fish. & Wildl. No. 68, 80 p.

This history of the salmon in the Great Lakes describes the decline and extinction of the Atlantic salmon (Salmo salar) in Lake Ontario in the 1800's; the failure to establish, by salmon culture, permanent or sizable populations of Atlantic or Pacific salmon in any of the Great Lakes in 1867-1965; and the success of the plantings of coho (Oncorhynchus kisutch) and chinook salmon (O. tshawytsha) in the Great Lakes, in 1966-70 -- particularly in Lake Michigan. Despite plantings of 5 million fry and fingerlings from Lake Ontario stocks in 1866-84, the native Atlantic salmon in Lake Ontario became extinct in the late 1800's primarily because tributaries in which they spawned were blocked by mill dams. Plantings of 13 million chinook salmon and landlocked and anadromous forms of Atlantic salmon in Lake Ontario and the other Great Lakes in 1873-1947 failed completely. The first species to develop a self-sustaining population was the pink salmon (O. gorbuscha), which was planted in Lake Superior in 1956; however, it has not become abundant. A salmon fishery finally was established when 15 million coho salmon and 6 million chinook salmon were planted as smolt in the Great Lakes in 1966-70. In 1970, for example, 576,000 coho salmon (12% of those planted in 1969) were caught by anglers in Lake Michigan. Most weighed 5 to 10 pounds (2.3-4.5 kg). Sport fishing for salmon was fair in Lakes Superior and Huron, and poor in Lakes Erie and Ontario. By 1970, natural reproduction of coho, chinook, pink, and kokanee (O. nerka) salmon had occurred in some tributaries of one or more of the upper three Great Lakes. It is expected, however, that the sport fishery will continue to be supported almost entirely by planted fish. (Auth.)

18006. Wildish, D. J., and R. L. Phillips (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). 1974. AN IDENTIFICATION STRATEGEM FOR BENTHOS COLLECTED TO ASSESS MARINE AND ESTUARINE POLLUTION. Fish. Res. Board Can. Tech. Report No. 450, 30 p., Manuscript Status.

An identification strategy for benthos collected to determine some biological effects of pollution is presented. The concept is illustrated with sublittoral infauna collected during 1969 to 1972 to assess the effects of a pulpmill effluent in L'Etang Inlet, New Brunswick, Canada. The tabular key method of Newell was modified to provide rapid, accurate identifications with the least number of character states possible. Information from the developing key was computer compatible, allowed the user to reach the primary ecological and toxicological literature for given taxa and avoided information redundancy because it applied in a specified geographical area at a specified time. (Authors)

18007. Harris, J. E. (Dept. of Biol. Sci., Univ. of Exeter, Exeter, Devon, England). 1974. ELECTROPHORETIC PATTERNS OF BLOOD SERUM PROTEINS OF THE CYPRINID FISH, Leuciscus leuciscus (L.). Comp. Biochem. Physiol., 48(3B): 389-399.

The blood serum proteins of dace (Leuciscus leuciscus L.) have been examined by electrophoresis in polyacrylamide gels. Between five and nine major protein fractions could be identified in each serum sample and up to a further five minor, more diffuse fractions were occasionally resolved in individual fish. The intraspecific variations in the sera of some forty-four fish collected over a period of eleven months have been analyzed. In general, although variation occurred in all components of dace sera it was difficult to establish any direct correlation between these changes and environmental and physiological factors. The possible reasons for this are discussed and some of the problems associated with this work are demonstrated. Comparisons have been made between fish and human serum protein patterns and tentative identifications of several of the major components were made. (Auth.)

18008. FAO Products Conference. 1974. INTENSIVE CULTURE INDUSTRY - CATFISH FARMING IN THE UNITED STATES. Fish Farming International No. 2, pp. 110-115.

18009. Watanabe, Takeshi, Fumio Takashima, and Chinkichi Ogino (Tokyo Univ. of Fisheries, Konan 4, Minato-ku, Tokyo, Japan). 1974. EFFECT OF DIETARY METHYL LINOLENATE ON GROWTH OF RAINBOW TROUT. Bull. Jap. Soc. Sci. Fish., 40(2): 181-188. In English.

The growth and histological changes of rainbow trout kept on a diet deficient in essential fatty acid (EFA) are described. Feeding the purified diets containing no fat or no polyunsaturated fatty acids resulted in poor growth, low feed conversion, high mortality, and a shock syndrome. The whole body, muscle and whole viscera of fish fed on EFA deficient diet were considerably high in water content and low in both protein and lipid contents. The content of liver lipid was also high, indicating a sign of fatty liver. On histological examination, the effect of linolenic acid deficiency was clearly recognized in the liver, muscle, kidney and pancreas. The symptoms were almost completely prevented by the addition of 1% methyl linolenate to the diet. It may be concluded from these results that linolenic acid plays an essential role in rainbow trout as assigned to linolenic acid in mammals. (Authors)

18010. Shrivastava, H. (Can. Centre for Inland Waters, Great Lakes Biolimnol. Lab., Burlington, Ontario, Canada). 1974. MACROBENTHOS OF LAKE HURON. Fish. Res. Board Can. Technical Report No. 449, 45 p., Manuscript Status.

Duplicate mud samples were collected by Ponar grab in April and June, 1971, from 72 monitoring stations on Lake Huron. The most abundant groups were Amphipoda (average 340 ind./m^2), Oligochaeta (290/m^2), Sphaeriidae (190/m^2), Gastropoda (35/m^2) and chironomid larvae (35/m^2). Amphipods, oligochaetes and gastropods were represented by 2, 18 and 9 species respectively. The dominant species were Pontoporeia affinis Lindstrom (Amphipoda) representing 38% of the total number of macrobenthos recorded and Stylodrilus heringianus Claparède (Oligochaeta) representing 18%. The average number of the total population of macrobenthos was 900 individuals/m^2. The corresponding average for the sublittoral (9-25 m) was 700/m^2, for the epiprofundal (25-100 m) 1080/m^2, and for the profundal (100-200) it was 720/m^2. The dry weight of the macrobenthos averaged 1.26 g/m^2 for the entire lake. Corresponding values for the sublittoral, epiprofundal and profundal regions were 1.4, 1.35 and 0.7 g/m^2 respectively. The results indicate that the population of Amphipoda has decreased and the population of Oligochaeta has increased substantially since 1952 and 1956. The decrease in Pontoporeia is very evident in the Straits of Mackinac. Depth distribution studies suggest that the range 25-35 m seems to be favourable for all organisms in the Great Lakes. An overall interpretation of the study suggests that Lake Huron currently is in its early phase of mesotrophy. (Auth.)

18011. Popova, G. V. (Central Lab. Nature Preservation, USSR Min. of Agric., Moscow, USSR). 1970. EFFECTS OF PESTICIDES ON FISH. In: Eksperimental'naya Vodnaya Toksikologiya Materialy Vsesoyuznogo Simpoziuma (1st), 13-15; From: Health Aspects of Pesticides, 72-2348; Weed Abstracts, 22(11): abstract 2687.

A review. Experiments with diuron, propanid (propanil) and monuron revealed that alterations in the composition of the blood are the most sensitive indicator for the presence of pesticides in fish.

18012. Hardy, C. J. (Fish. Div., Marine Dept., Christchurch, N. Z.). 1972. SOUTH ISLAND COUNCIL OF ACCLIMATISATION SOCIETIES PROCEEDINGS OF THE QUINNAT SALMON FISHERY SYMPOSIUM 2-3 OCTOBER 1971 – ASHBURTON. New Zealand Marine Dept. Fish. Tech. Report No. 83, 298 p., illus., Wellington, New Zealand.

18013. Ashley, Laurence M. (Western Fish Nutrition Lab., US Dept. of Interior, Bur. of Sport Fish. & Wildl., Cook, Washington). 1973. ANIMAL MODEL OF HUMAN DISEASE. Reprint from: American Journal of Pathology, 72(2): 345-348, illus.

Liver cell carcinoma in rainbow trout is described as an animal model.

18014. Carr, John F., James W. Moffett, and John E. Gannon (U. S. Fish & Wildlife Service, Great Lakes Fish. Lab., Ann Arbor, Michigan 48107). 1973. THERMAL CHARACTERISTICS OF LAKE MICHIGAN, 1954-55. Tech. Papers of the Bur. of Sport Fish. & Wildl. No. 69, 143 p.

The thermal regime of Lake Michigan is described on the basis of the analysis of 1,671 bathythermograph casts made in 1954 and 1955. The beginning, duration, geographic extent, and ending of thermal stratification were determined from 51 thermal profiles from all areas of the open lake. The lake gained heat for about 5 months (mid-March to mid-August) and lost heat over the rest of the year. It was thermally stratified during much of the warming cycle and vertically isothermal during much of the cooling cycle. The annual warming period began by April and was well underway by mid-May. During the transitional period between the isothermal conditions of winter and the thermal stratification of summer, the rate of warming was relatively fast. Seasonal warming began in the shallow inshore waters, which were usually thermally stratified by mid to late May. Stratification persisted in the deeper offshore water into December. Maximum surface temperatures and highest average metalimnion temperatures were reached in early August. Local variations in water temperatures during stratification, however, were a common feature of the thermal characteristics of Lake Michigan. These sometimes sudden changes were caused by upwellings of cold bottom waters that in some instances affected areas of hundreds of square miles. During the warming period of 1954, the heat content of Lake Michigan increased an average of 425 gm-cal/cm^2/day. The annual heat budget of the lake for 1954 was 51,700 calories which is similar to that reported for 1942 (50,000 calories) and 1943 (62,000 calories). Heat was lost from mid-August until March, at a rate of about 250 gm-cal/cm^2/day. Seasonal thermal characteristics differed little between 1954 and 1955, and were similar to those observed during studies in 1941 and 1942. (Authors)

18015. Ernst, W., and H. Goerke [Inst. für Meeresforschung; Bremerhaven, Germany (FRG)]. 1974. ACCUMULATION, DISTRIBUTION, TRANSFORMATION AND ELIMINATION OF DDT-^{14}C IN Solea solea (PISCES: SOLEIDAE) [Anreicherung, Verteilung, Umwandlung und Ausscheidung von DDT-^{14}C bei Solea solea (Pisces: Soleidae)]. Marine Biology, 24(4): 287-304. In German.

Common soles Solea solea (L.) are extremely suitable for studying the fate of pesticides in marine fish by means of laboratory experiments involving small-sized, accurately controlled, closed aquarium systems. In 5 different experiments, a total of 16 fishes of Age Group I were maintained in water of 10°C and 20 °/oo S continuously filtered through charcoal, and given oral doses of 0.85 µg DDD-^{14}C up to 5 times/week. A total application of 1.7, 17 or 35 µg DDT-^{14}C, corresponding to 3, 28 or 57 experimental days, resulted in 72, 60 or 43% DDT-^{14}C accumulation. After feeding with 17 µg unlabelled DDT over a period of 4 weeks and final feeding with 1.7 µg ^{14}C-labelled DDT for 2 days, S. solea displayed the same percentage (74%) of accumulated DDT-^{14}C as after feeding with 1.7 µg DDT-^{14}C without prior feeding. Therefore, the decreasing accumulation percentages with increasing doses, i.e., with longer application periods, are due to elimination during the application period. During a period of 2 months in pesticide-free water, S. solea eliminated 62% of the DDT-^{14}C which it had accumulated after feeding with 17 µg DDT-^{14}C over a period of 4 weeks. The gastro-intestinal tract is assumed to be a major route of DDT elimination. Independent of dosage, there was a characteristic distribution pattern of accumulated DDT: brain, liver and gastro-intestinal tract ranked highest, while the concentration in skeletal muscle was lowest. Even during the elimination period the pattern appeared unchanged. DDE, DDD and a polar component occurred as metabolites, but in all organs more than 80% of the accumulated DDT remained unchanged. Percentages of metabolites were higher in liver and gastro-intestinal tract than in skeletal muscle. Prolonged exposure to DDT in the diet induced DDT transformation in the gastro-intestinal contents, most probably in the bacterial flora of the gut. (Authors)

18016. Rogers, I. H., and H. W. Mahood (Pacific Environ. Inst., W. Vancouver, Brit. Columbia, Canada). 1974. REMOVAL OF FISH-TOXIC ORGANIC SOLUTES FROM WHOLE KRAFT EFFLUENT BY BIOLOGICAL OXIDATION AND THE ROLE OF WOOD FURNISH EXTRACTIVES. Fish. Res. Board Can. Tech. Report No. 434, 43 p. Manuscript Status.

18017. Alikin, Yu. S. (Inst. of Physiol., Siberian Dept., USSR Acad. of Sciences, Novosibirsk, USSR). 1973. POTENTIOMETRIC DETERMINATION OF CO_2 IN THE EXTERNAL RESPIRATION OF FISH. J. Ichthyol., 13(2): 317-322.

A method is proposed for the potentiometric titration of CO_2 evolved in aquatic animals which may be used to trace the alteration of CO_2 content in the water by two means simultaneously: by direct titration of free CO_2 and by titration of total carbonates (the relative error of the method is 1-3%). Characteristics of the evolution of free CO_2 and hydrocarbonates are noted with special reference to a study of the Baikal grayling (Thymallus arcticus baicalensis Dyb.): a) the curve depicting the dependence of the evolution of free CO_2 on temperature is similar to the "Kroghian" curve of O_2 consumption, b) CO_2 calculated by hydrocarbonates is in excess of the amount of free CO_2 evolved and constitutes a "hydrocarbonate" increase, one cause of the appearance of which may be the characteristics of ion exchange in fish. (Auth.'s conclusions)

18018. Lanzing, W. J. R., and D. R. Higginbotham (School of Biol. Sci., Univ. of Sydney, Sydney, N.S.W. 2006, Australia). 1974. SCANNING MICROSCOPY OF SURFACE STRUCTURES OF Tilapia mossambica (Peters) SCALES. J. Fish Biol., 6(3): 307-310.

Scanning microscopic observations were made of the surface structures of isolated scales of Tilapia mossambica (Peters). The circuli were found to form numerous minute processes called scalar denticles, which may act to secure the position of the scale with reference to surrounding dermal tissues. The skin covering the lunula of the scale includes a number of pores which are thought to represent the terminal openings of dermal mucous cells. This part of the skin also shows peculiar epidermal surface patterns. These surface patterns may be indicative of areas subject to increased mechanical stress. (Authors)

18019. Kikuchi, Takahiko, Yasuharu Sekizawa, Yayoi Ikeda, and Hisao Ozaki (Lab. Biol., Res. Labs, Meiji Seika Kaisha, Lts., Morooka-cho, Kohoku-ku, Yokohama, Japan). 1974. BEHAVIORAL ANALYSES OF THE CENTRAL NERVOUS SYSTEM DEPRESSANT ACTIVITY OF 2-AMINO-4-PHENYLTHIAZOLE UPON FISHES. Bull. Jap. Soc. Sci. Fish., 40(4): 325-337. In English.

According to the modified McFarland's criterion and the diagrammatical display procedure, behavioral analyses of the central nervous system depressant activity of 2-amino-4-phenylthiazole, a piscine anesthetic, were carried out. Carp (Cyprinus carpio) as a representative of fresh water type, rainbow trout (Salmo gairdnerii irideus) as a mid type between fresh and salt water and yellowtail (Seriola quinqueradiata) as a salt water type were used. The analyses resulted in establishing a methodological standardization procedure for the application of anesthetics upon a given fish for handling and transportation for aquacultural use. For the bathing anesthetization of carp, a concentration at 30-40 ppm provided good anesthesia for 20-40 min. For the bathing sedation, a concentration at 12 ppm provided good sedation for 3-72 hr. For the bathing anesthetization of rainbow trout, a concentration at 20-30 ppm provided good anesthesia for 40 min to 3 hr and for the bathing sedation, a concentration at 10 ppm provided good sedation for 24 hr. For the bathing anesthetization of yellowtail, a concentration at 15-20 ppm provided good anesthesia for 10-25 min. For the bathing sedation, a concentration at 8 ppm provided good sedation for 4.5 hr. (Authors)

18020. Rajagopal, Pokkavil K., and Robert H. Kramer (Utah Coop. Fish. Unit, Utah State Univ., Logan, Utah). 1974. RESPIRATORY METABOLISM OF UTAH CHUB, Gila atraria (Girard) AND SPECKLED DACE, Rhinichthys osculus (Girard). J. Fish Biol., 6(2): 215-222.

Measurements of active, standard and routine oxygen consumption were made for 207 Utah chub at 6°, 9°, 12°, 18° and 22°C; and 123 speckled dace at 4°, 8°, 12° and 18°C. These were expressed as mathematical functions of water temperature and size of the fish. The mean slopes of $\log_e$ oxygen consumption (mg O_2/h) and $\log_e$ wet weight (g) were 0.771, 0.526, and 0.619 for active, standard, and routine rates respectively for Utah chub, and 0.943, 0.486, and 0.683 respectively for speckled dace. (Authors)

18021. Brooker, M. P., and R. W. Edwards. (Dept. appl. Biol., Univ. Wales Inst. Sci. Technol., Cathays Park, Cardiff, Wales, United Kingdom). 1973. EFFECTS OF THE HERBICIDE PARAQUAT ON THE ECOLOGY OF A RESERVOIR. 2. COMMUNITY METABOLISM. Freshwater Biol. 3, pp. 383-389; Weed Abstracts, 23(5): p. 102, abstract 919.

Changes in the metabolism of a reservoir, treated with paraquat to control aquatic plants, are described using data provided by a submersible oxygen and temperature recorder. As a result of the herbicide-induced death of the plants, gross oxygen production and the efficiency of utilization of solar radiation declined. However, the total respiratory demand also declined at this time and there was no dramatic shift in the P : R ratio (grass production : community respiration). Subsequently, oxygen production and the efficiency of utilization of solar radiation increased as a result of the growth of filamentous and macrophytic algae. (From summ.)

18022. Miles, Harry M., Susan M. Loehner, David T. Michaud, and Sandra L. Salivar (Dept. of Biol., Marquette Univ., Milwaukee, Wisconsin 53233). 1974. PHYSIOLOGICAL RESPONSES OF HATCHERY REARED MUSKELLUNGE (Esox masquinongy) TO HANDLING. Trans. Amer. Fish. Soc., 103(2): 336-342.

Increases in plasma lactate and glucose concentrations, along with decreases in plasma chloride and liver glycogen concentrations, were observed in muskellunge in response to capture and handling. Holding muskellunge in 0.3% NaCl alleviated some of the physiological symptoms of stress, but holding the fish in the lake for 48 hr before release had no effect. Physiological responses to fin-clipping and transport by truck were slight in comparison to that of original capture. Salt treatment and reduction in duration and frequency of handling is recommended. (Authors)

18023. Weiler, R. R. (Dept. of the Environ., Fish. & Mar. Serv., Great Lakes Biolimnol. Lab., Can. Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. EXCHANGE OF CARBON DIOXIDE BETWEEN THE ATMOSPHERE AND LAKE ONTARIO. J. Fish. Res. Board Can., 31(3): 329-332.

The calculated flux of carbon dioxide between Lake Ontario and the atmosphere ranged from about 0.1 gC m^{-2} day^{-1} during the summer to about 3 during a winter storm. During the summer, the amount of carbon supplied from the atmosphere was from 5 to 30% of the estimated amount utilized in primary production. Also Lyman's dissociation constants for carbonic acid were found applicable to the carbonate system of the lake. (Auth.)

18024. Galinskiy, V. L., I. P. Lubyanov, and G. V. Mel'nikov (Hydrobiol. Res. Inst., Dnepropetrovsk Univ., USSR). 1973. THE FOOD RESOURCES OF FISH AND WAYS OF INCREASING THE FISH PRODUCTIVITY OF THE DNEPRODZERZHINSK RESERVOIR. J. Ichthyol., 13(1): 129-135.

Many years of research on the food resources of fish in Dneprodzerzhinsk reservoir have shown that these resources are characterized by high productivity and biomass of zooplankton and benthos. In order to make rational and effective use of the food resources it is desirable that the abundance of the species of fish already existing in the reservoir should be increased and that the bighead [Aristichthys nobilis (Rich.)] should be introduced. The fish productivity of the reservoir may be doubled by carrying out a combination of essential improvement measures in the shallows.

18025. Ferguson, A. (Dept. of Zool., The Queen's Univ., Belfast BT7 1NN, Northern Ireland). 1974. THE GENETIC RELATIONSHIPS OF THE COREGONID FISHES OF BRITAIN AND IRELAND INDICATED BY ELECTROPHORETIC ANALYSIS OF TISSUE PROTEINS. J. Fish Biol., 6(3): 311-315.

The electrophoretic patterns of the general proteins, esterases, creative kinase and phosphoglucomutase of white muscle from Lough Neagh pollan, Lough Erne pollan, Lake Bala gwyniad, Loch Lomond powan, Haweswater schelly and Bassenthwaite vendace are consistently of three types. It is therefore suggested that the coregonids examined are three distinct species: the pollans; gwyniad, powan and schelly; vendace. Vendace is genetically closer to the gwyniad group than to the pollans. (Auth.)

18026. Chu, Ar Jone, and Tasuku Hanaoka (Dept. of Fish. Fac. of Agric., Kyushu Univ., Fukuoka, Japan). 1974. STUDIES ON THE OSMOTIC PRESSURE OF ENVIRONMENTAL MEDIA AND BODY FLUIDS OF MARINE FISH - III. SEASONAL CHANGES IN SERUM OSMOTIC PRESSURE IN A DEMERSAL FISH IN RELATION TO THE GONADAL MATURATION. Bull. Jap. Soc. Sci. Fish., 40(4): 319-324. In English.

A study has been made on the seasonal changes of the osmotic pressure of serum in the right-eyed flounder, Limanda yokohamae, a winter-spring spawner, in relation to its gonadal maturation throughout a year. An increase in serum osmolality at spawning time, as seen in the pelagic fish Scomber japonicus and Trachurus japonicus, spring-summer spawners, reported in the previous paper, was also observed in this species. However the range of change was very limited, averaging a 14% rise only in serum osmolality as compared with about 50% in the pelagic fish. Also a counterclockwise migratory triangular diagram could be drawn from "osmotic pressure and temperature relation" for the surrounding sea water, as against the clockwise one for the pelagic S. japonicus and T. japonicus, showing marked different characters between both types of spawners. (Authors)

18027. Banse, Karl, and Katharine D. Hobson (Dept. of Oceanography, Univ. of Wash., Seattle, Washington 98195). 1974. BENTHIC ERRANTIATE POLYCHAETES OF BRITISH COLUMBIA AND WASHINGTON. Bull. Fish. Res. Board Can. No. 185, 111 p., illus.

18028. Ivankov, V. N. (Far Eastern Univ., Vladivostock, USSR). 1973. HYBRIDS BETWEEN THE AUTUMN CHUM SALMON [Oncorhynchus keta (Walb.)] AND THE COHO SALMON [O. kisutch (Walb.)]. J. Ichthyol., 13(1): 149-151.

On September 14, 1968, 5 unusually colored fish were found among chum salmon caught in the Buyuklinka River (a tributary of the Poronary River, Sakhalin Island) for artificial breeding at the Buyukliy hatchery. The general shade of the body resembles the coloring of the chum except that the transverse bands on the sides were practically imperceptible, although the salmon were in breeding colors and their eggs were ripe. There were dark spots on the back and tail of the fish, as in the coho. The sides of the body in the region of the anal fin were dark raspberry (similar to the body coloring of the coho in the breeding colors). The caudal peduncle was obviously deeper than in the chum. These fish were hybrids between the chum [Oncorhynchus keta (Walb.)] and the coho [O. kisutch (Walb.)]. Analysis of the morphological indicators of the 5 hybrids established that the hybrids were closer to the coho in the relative depth and length of the caudal peduncle, body depth and head length, although the shape of the body was on the whole highly reminiscent of that of the chum. Unfortunately, we did not succeed in obtaining F2 progeny from the hybrids since all the hybrids caught were females. M. M. Zolotareva, the chief engineer of the hatchery, has reported that hybrid males arrived to spawn in September 1967, i.e., they matured a year earlier than the females, at an age of 2+. The phenomenon of heterosis was not observed in the hybrids between the chum and the coho. The successful hybridization of the Buyuklinka chum with the coho provides factual confirmation that it is impermissible to assess the phylogenetic segregation of the coho from other members of the genus Oncorhynchus on the basis of previous unsuccessful attempts at its hybridization with Pacific salmon. The unequal effectiveness of hybridization of the chum and the coho in different regions is evidently to be explained by the effect of genetic differences in fish of local populations of the same species.

18029. Walsh, G. E. (Environ. Protect. Agency, Gulf Breeze Lab., Sabine Island, Florida 32561). 1972. INSECTICIDES, HERBICIDES AND POLYCHLORINATED BIPHENYLS IN ESTUARIES. J. of the Washington Acad. of Science, 62(2): 122-129; From Health Aspects of Pesticides, 73-1953; Weed Abstracts, 23(5): 100, abstract 904.

The effects of insecticides, herbicides and polychlorinated biphenyls on the survival, photosynthesis, behaviour, metamorphosis, resistance and chemical changes in tissues of estuarine organisms are reviewed. Algae were found to be very sensitive to the substituted ureas and triazines but most of the work on herbicides has been in fresh water systems rather than estuaries.

18030. Novak, John K., and Ray D. Estes (Dept. of Biol., Va. Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1974. SUMMER FOOD HABITS OF THE BLACK SCULPIN, Cottus baileyi, IN THE UPPER SOUTH FORK HOLSTON RIVER DRAINAGE. Trans. Amer. Fish. Soc., 103(2): 270-276.

A summer food habit study was conducted on 300 specimens of the black sculpin, Cottus baileyi Robins, collected from the upper South Fork Holston River and four tributaries in southwestern Virginia from July to October 1966. Frequency of occurrence, average number, and percent of total were determined for all organisms occurring in the stomachs. Analysis of stomach contents revealed a diet consisting almost exclusively of immature aquatic insects encompassing a wide range of morphological and behavioral differences. Cottus baileyi fed throughout the daylight hours taking whatever was available. Forage ratios ranging from 0.1 to 10.3 were determined for a selected group of insects that represented a wide diversity of habits. Baetis, Pseudocloeon, Antocha, and chironomids had forage ratios greater than 1.0. Baetids and chironomids were the most important food items in the diets of all sizes of fish. Habits of insects largely determined the extent they were preyed upon by C. baileyi. (Authors)

18031. Baskett, Russell C., and William J. Lulves (Dept. of Microbiol., The Univ. of Missouri School of Medicine, Columbia, Missouri 65201). 1974. A METHOD OF MEASURING BACTERIAL GROWTH IN AQUATIC ENVIRONMENTS USING DIALYSIS CULTURE. J. Fish. Res. Board Can., 31(3): 372-374.

An inexpensive, easy-to-use method was developed for studying microbial growth and behavior in situ. Dialysis tubing suspended from a styrofoam flotation ring was filled with sterile distilled water, placed in a farm pond, and inoculated with Brevibacterium sp. The viable population within the tubing increased significantly within 96 h, indicating that nutrients in the pond water necessary for growth and multiplication of Brevibacterium sp. diffused through the dialysis membrane. (Authors)

18032. Vasil'yev, A. S., and S. I. Gleyzer (Atlantic Res. Inst. for Sea Fisheries and Oceanography (AtlantNIRO) and Kaliningrad Fish Industry and Fisheries Tech. Inst., USSR). 1973. CHANGES IN THE ACTIVITY OF THE FRESHWATER EEL [Anguilla anguilla (L.)] IN MAGNETIC FIELDS. J. Ichthyol., 13(2): 322-324.

A magnetic field with an induction of 0.2 tl changes the motor activity of young eels in freshwater. In the presence of a field activity increases by 10-20%, while the aftereffect is expressed in a decline of activity to 38% below normal. It is shown that the activity level of the eel in freshwater declines in a regular manner in connection with gradual reduction of the induction of the external magnetic field from 0.3 tl to zero. The activity of the eel is practically halved. An increase in salinity produces a corresponding intensification in the stimulating effect of the magnetic field on young eels which is evidently connected with the increasing role of the magnetohydrodynamic effect. The eels tend to move along the force line (80% of instances) in the homogeneous part of the magnetic field; such behavior is an indication that the magnetic field has an irritant effect on the fish and that they attempt to minimize the dose of the stimulus which they receive.

18033. Hunt, P. C., and J. W. Jones (Freshwater Fish. Unit, Dept. of Zool., Univ. of Liverpool, England). 1974. A POPULATION STUDY OF Barbus barbus (L.) IN THE RIVER SEVERN, ENGLAND I. DENSITIES. J. Fish Biol., 6(3): 255-267.

The results of the application of Schnabel (Chapman modification), Schumacher & Eschmeyer, Fisher & Ford, and Jolly capture-recapture techniques on the Barbus barbus L. population in four areas of the middle Severn are compared. The survival of tagged fish varied in different areas and fish released in some time periods were less vulnerable to recapture than fish released from other samples. It is suggested that the shoaling behaviour of Barbus barbus resulted in non-random mixing of marked fish. The average population size of Barbus barbus greater than 18 cm in length in each of the four sections for the total period of investigation gave population densities ranging from 0.024/m^2 to 0.202/m^2. (Authors)

18034. Lewis, William M., Roy Heidinger, William Kirk, Wayne Chapman, and Danny Johnson (Fish. Res. Lab. and Dept. of Zool., Southern Illinois Univ., Carbondale, Illinois 62901). 1974. FOOD INTAKE OF THE LARGEMOUTH BASS. Trans. Amer. Fish. Soc., 103(2): 277-280.

During 18 months of electrofishing a sample of 991 adult largemouth bass (Micropterus salmoides) was taken from Crab Orchard Lake. The stomach contents were removed in the field with a gastroscope. Gizzard shad (Dorosoma cepedianum) constituted the principal forage fish. Approximately 50% of the bass collected had empty stomachs. As the size of bass increased, the food intake as a percent of body weight decreased. Ninety percent of the bass stomachs contained one food item. When more than one food item was found, they were usually in the same stage of digestion. It is suggested that the high percent of empty stomachs was related to hunting success, or that the onset of the feeding stimulus in association with rate of digestion might result in a periodicity of feeding that involves a high percent of empty stomachs. A higher relative intake of food by small bass was postulated to be a result of the bass's typically consuming only one fish. Inasmuch as the forage fish were relatively uniform in size, one fish constituted a large meal for a small bass but not for a large bass. (Authors)

18035. Mason, J. C. (Fish. Res. Board Can., Pacific Biol. Sta., Nanaimo, British Columbia, Canada). 1974. ASPECTS OF THE ECOLOGY OF JUVENILE COHO SALMON (Oncorhynchus kisutch) IN GREAT CENTRAL LAKE, B. C. Fish. Res. Board Can. Tech. Report No. 438, 37 p., Manuscript Status.

18036. Hunt, P. C., and J. W. Jones (Freshwater Fish. Unit, Dept. of Zool., Univ. of Liverpool, England). 1974. A POPULATION STUDY OF Barbus barbus (L.) IN THE RIVER SEVERN, ENGLAND II. MOVEMENTS. J. Fish Biol., 6(3): 269-278.

Five hundred and thirty one of a total of 3122 tagged Barbus barbus (L.) in the middle Severn were recaptured using electric fishing and angling. Ninety two barbel were recaught downstream of the site of tagging, 152 upstream and 287 did not move. Electric fishing was selective for home recaptures. The barbel population was divisible into mobile and static components; 86% remained within 5 km, the remainder wandering more widely up to a maximum of 34 km from their site of tagging. Movement seemed to be dependent on size of the fish. (Authors)

18037. Kanid'ev, A. N., and E. A. Gamygin (VNIIPRKh, USSR). 1973. AN EFFECTIVE DIET FOR YOUNG TROUT (Effektivnaya Dieta dlya Molodi Foreli). Rybnoe Khozyaĭstvo No. 12, pp. 17-18. In Russian.

An experimental diet containing fish meal, meat-bone meal, dry albumin, dry skimmed milk, wheat flour, wheat bran, hay flour, soya flour, hydrolyzed yeast, flax grist and vitamin supplements proved to be far superior to a control diet based on spleen.

18038. Sekino, Kiyonari, Takashi Saito, Hiroshi Nishiyama, and Teiji Kariya (Mar. Fish. Lab., Fac. of Agric., Tohoku Univ., Onagawa, Miyagi, Japan). 1974. A METHOD TO ESTIMATE THE TIME OF DEATH IN FISH BY RETINO-MOTOR RESPONSE. Bull. Jap. Soc. Sci. Fish., 40(4): 363-368. In Japanese.

If a response with a prominent diurnal rhythm in fish body ceases its cycle just when the fish died and does not change for a reasonable period, it may be possible to estimate the time of death by observing the phase of that response of the dead fish. Attempts were made to use the retino-motor response of fish for this estimation. To find the characters of the retina in every phase, the position of the cone, the width of the pigment layer and the state of the pigment were observed, and the illuminance was measured. The characters of the retina in the daytime, at dusk, at night and at dawn were defined respectively. The retina kept the light-adapted state when the illuminance was more than five lux. Generally the state of the retina did not change for twelve hours after death even in such a high water temperature as in summer. Therefore, when dead fish are obtained from the common pond, river and sea, to observe their retina and compare it with the four characters is useful for the estimation of the period of time in which the fish died.

18039. Hines, Ron S., and Dan T. Spira (Fish and Aquacult. Sta., Agric. Res. Org., Dor, D. N. Hof-Hacarmel, Israel). 1974. ICHTHYOPHTHIRIASIS IN THE MIRROR CARP Cyprinus carpio (L.) III. PATHOLOGY. J. Fish Biol., 6(2): 189-196.

The microscopical pathology of Ichthyophthiriasis was studied in a group of mirror carp infected with measured numbers of parasites under standardized conditions. Primary pathology consisted of inflammatory, proliferative, and degenerative changes in the epidermis and hyperaemia and oedema of the spongiose dermis. This was accompanied by changes in the amount and distribution of pigment in the spongiose dermis. Proliferation of interlamellar epithelial tissue of the gills in response to the parasite resulted in partial or complete filling of the interlamellar spaces. Secondary changes noted in the disease were devacuolization of hepatocytes, leukocytic depletion of the mesonephric kidneys, and leukocytic metaplasia or hyperplasia in the spleen. (Authors)

18040. Peterson, R. H., and V. Zitko (Fish. Res. Board Can., Biol. Sta., St. Andrews, New Brunswick, Canada). 1974. VARIATIONS IN INSECT DRIFT ASSOCIATED WITH OPERATIONAL AND EXPERIMENTAL CONTAMINATION WITH FENITROTHION IN NEW BRUNSWICK. Fish. Res. Board Can. Tech. Report No. 439, 23 pp. Manuscript Status.

18041. Kroger, Richard L., James F. Guthrie, and Mayo H. Judy (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1974. GROWTH AND FIRST ANNULUS FORMATION OF TAGGED AND UNTAGGED ATLANTIC MENHADEN. Trans. Amer. Fish. Soc., 103(2): 292-296.

Tagged Atlantic menhaden, Brevoortia tyrannus, along with nontagged controls were held captive in a natural cove at Beaufort, North Carolina from December 1970 to January 1972. Rate of growth, annulus formation and increase in scale diameter was the same for control menhaden and those tagged one, two or three times. Growth of fish in the cove was similar to all other previous estimates obtained from back-calculated length-frequency studies. Both development of scales and growth of fish were correlated with annual temperature changes, and only one annulus formed during the year. Larval menhaden, which were thought to require water of low salinity to metamorphose into normal juveniles, transformed in the cove where the salinity was 30 °/oo. An "inner ring," which forms on the scales when menhaden are 50 to 70 mm and occurs on about 15% of the scales from commercial Atlantic menhaden landings some years, may represent a true annulus formed by very small juveniles from Long Island Sound, New York. (Authors)

18042. Nelson, Gary J., and Virgie G. Shore (Bio-Med. Div., L. Livermore Lab., Univ. of California, Livermore, California). 1974. CHARACTERIZATION OF THE SERUM HIGH DENSITY LIPOPROTEINS AND APOLIPOPROTEINS OF PINK SALMON. J. Biol. Chem., 249(2): 536-542.

18043. Beukema, J. J., and G. J. de Vos (Org. for Improvement of Inland Fish., Utrecht, The Netherlands). 1974. EXPERIMENTAL TESTS OF A BASIC ASSUMPTION OF THE CAPTURE-RECAPTURE METHOD IN POND POPULATIONS OF CARP Cyprinus carpio L. J. Fish Biol., 6(3): 317-329.

Carp Cyprinus carpio L. populations of known composition as to size and descent were fished in drainable ponds in various ways to judge the validity of the mark-recapture method for estimation of population size. Six combinations of gear for capture and recapture were employed, including fyke-traps, seines and angling-rods. Satisfactory estimates could be obtained only when the selectivity of the gear for recapture differed from that used for marking. Some differences and changes in behaviour of the carp underlying observed biased estimates are examined. (Authors)

18044. Colby, Peter J. 1973. RESPONSE OF THE ALEWIVES, Alosa pseudoharengus, TO ENVIRONMENTAL CHANGE. Reprint from: Responses of Fish to Environmental Changes, Walter Chavin, editor, Chap. V, pp. 163-198. Charles C. Thomas, Springfield, Illinois.

18045. Burbidge, Richard G. (Va. Inst. of Mar. Sci., Gloucester Point, Virginia 23062). 1974. DISTRIBUTION, GROWTH, SELECTIVE FEEDING, AND ENERGY TRANSFORMATIONS OF YOUNG-OF-THE-YEAR BLUEBACK HERRING, Alosa aestivalis (Mitchill), IN THE JAMES RIVER, VIRGINIA. Trans. Amer. Fish. Soc., 103(2): 297-311.

A direct relationship existed between standing crops of zooplankton and distribution, growth, and feeding of young-of-the-year blueback herring, Alosa aestivalis, in the James River, Virginia. Zooplankton densities were highest upstream where food consumption and growth rates were correspondingly highest. A progressive downstream decrease and upstream increase in fish abundance occurred during the study. Condition (K) decreased after flooding from Hurricane Camille. Blueback herring fed primarily on copepods (Eurytemora affinis, Cyclops vernalis, and Canthocamptus robertcokeri), but cladocerans (Bosmina sp. and Diaphanosoma brachyurum) were also important. Selection (electivity) was strongest for adult copepods and weakest for copepod nauplii. Selection for copepodites and Bosmina sp. was moderate to weak. Feeding occurred only during daylight. Predation on copepods and copepodites by blueback herring resulted in population dominance by the smaller Bosmina sp. Respiration experiments were carried out in the laboratory. The regression of oxygen consumption on temperature (routine metabolism) was expressed as Log O = 1.4451 + 0.0548 T, where O = oxygen consumption (mg O_2/g wet weight per hr), and T = temperature (C). Energy transformations were computed from growth and respiration values converted to their calorific equivalents. Mean maintenance requirement (% of food assimilated) was 88.3%, compared to 11.7% for growth (% of food assimilated). (Auth.)

18046. Sweeney, Robert A. (Great Lakes Lab., State Univ. College at Buffalo, Buffalo, New York). 1973. IMPACT OF DETERGENT PHOSPHATE REDUCTIONS ON WATER QUALITY. Proc. 16th Conf. Great Lakes Res., pp. 967-976. Internat. Assoc. Great Lakes Res.

18047. Sytina, L. A., and O. B. Timofeyev (deceased) (Inst. of Evolutionary Morphol. and Animal Ecol., USSR Acad. of Sciences, (IEMEZh), Moscow, USSR). 1973. PERIODIZATION IN THE DEVELOPMENT OF STURGEONS (ACIPENSERIDAE) AND THE PROBLEM OF THE VARIABILITY OF ORGANISMS. J. Ichthyol., 13(2): 230-244.

Consideration is given to some aspects of the variability of morphological characters in the early development stages of sturgeon larvae. We trace the alteration in the degree of variation of eponymous characters, the degrees of correlatability of individual parts and the dynamics of the appearance and establishment of characters of individual groups of larvae in the course of development. It is noted that there is a distinct morphological stage (transitional stage) in which the transition of a proportion of the individuals in the group to a new development stanza becomes possible. It is shown that the transition of the bulk of the individuals to a new stanza may be effected in different morphological stages in the course of the stanza in relation to development conditions and the quality of the larvae in each group.

18048. Watanabe, Takeshi, Ichiro Kobayashi, Osamu Utsue, and Chinkichi Ogino (Lab. of Fish. Biochem., Tokyo Univ. of Fish., Konan 4, Minato-ku, Tokyo, Japan). 1974. EFFECT OF DIETARY METHYL LINOLENATE ON FATTY ACID COMPOSITION OF LIPIDS IN RAINBOW TROUT. Bull. Jap. Soc. Sci. Fish., 40(4): 387-392. In English.

Rainbow trout fingerlings were kept on a fat-free diet or those supplemented with each of methyl laurate, methyl linolenate, and a mixture of soybean oil and cod liver oil, in order to see the effects of dietary lipids on the fatty acid composition of body lipids. The fat-free diet and one supplemented with methyl laurate brought about an elevation in the proportion of monoethylenic fatty acids, especially of 16:1ω7 and 18:1ω9 acids. Dietary linolenate or ω3 acids depressed the level of monoenes and elevated that of 22:6ω3 acid. These changes were much more conspicuous in phospholipids than in triglycerides. Neither the linolenate level nor the absence of fat in diets exerted any appreciable effect on the contents of vitamin A and E in the liver.

18049. Turuk, T. N. (Polar Res. and Planning Inst. for Sea Fisheries and Oceanography (PINRO), Murmansk, USSR). 1973. DIURNAL PERIODICITY IN FEEDING AND THE VERTICAL MOVEMENTS OF THE ATLANTIC COD (Gadus morhua L.) J. Ichthyol., 13(2): 275-288.

The results of a study of the feeding and daily vertical migrations of the Atlantic cod (Gadus morhua L.) are presented. Transition from benthic feeding to pelagic feeding resulted in daily vertical migrations. The daily feeding rhythm of the cod is dependent on the quality of the food consumed.

18050. Ogi, Haruo (Res. Inst. of N. Pac. Fish., Fac. of Fisheries, Hokkaido Univ., Hakodate, Japan). 1973. ECOLOGICAL STUDIES ON THE JUVENILE SOCKEYE SALMON, Oncorhynchus nerka (Walbaum), IN BRISTOL BAY, WITH SPECIAL REFERENCE TO ITS DISTRIBUTION AND POPULATION. Bull. Fac. Fish., Hokkaido Univ., 24(1): 14-41.

18051. Kushlan, James A. (Dept. of Biol., Univ. of Miami, Coral Gables, Florida 33124). QUANTITATIVE SAMPLING OF FISH POPULATIONS IN SHALLOW, FRESHWATER ENVIRONMENTS. Trans. Amer. Fish. Soc., 103(2): 348-352.

Most of the usual methods for studying fish populations have been ineffective when applied in the shallow, freshwater marshes of southern Florida. Exceptions are devices which trap fish by rapidly enclosing a known area of marsh. Of these, pull-up traps are best suited for sampling large areas for relatively large or widely dispersed fish, whereas drop traps with bottom nets are the most efficient for studies of small species at permanent sampling sites. Each produces comparable but consistently biased results due to habitat disturbance. The most precise data on shallow water fish communities are obtained by use of bottomless drop traps which are moved to new sites for each sample. (Auth.)

18052. Popova, G. V. (Central Lab. Nature Preservation, USSR Min. of Agric., Moscow, USSR). 1970. HAEMATOLOGICAL INDEXES DURING AN EVALUATION OF THE TOXICITY OF PESTICIDES FOR FISH. In: Eksperimental'naya Vodnaya Toksikologiya Materialy Vsesoyuznogo Simpoziuma (1st), 19-29; from: Health Aspects of Pesticides, 72-2407; Weed Abstracts, 22(11): abstract 2688, 1973.

18053. Whitaker, John, and Jack Martin (Fish. Res. Board Can. Freshwater Inst., Manitoba, Canada). 1974. THE CAGE REARING OF RAINBOW TROUT IN PRECAMBRIAN LAKES. Fish. Res. Board Can. Tech. Report No. 446, 13 p., Manuscript Status.

Experiments designed to evaluate the feasibility of rainbow trout cage culture in precambrian lakes were carried out at Heming Lake, Manitoba during the ice free seasons of 1972 and 1973. Seed fish averaging 1.7 g did not produce marketable trout (173 g round weight) by freeze up in 1972. In 1973, both 7.8 g and 13.9 g fingerlings produced marketable fish. Survival rates were 52% in 1972 and 54% in 1973 and bacterial disease was the major cause of mortality. The results indicate that cage culture of rainbow trout is biologically feasible. However, the high cost of fish food and fingerlings and the relatively low price for the finished product make the economic feasibility of cage culture uncertain. (Authors)

18054. Beland, Pierre (Dept. of Biol., Dalhousie Univ., Halifax, Nova Scotia, Canada). 1974. ON PREDICTING THE YIELD FROM BROOK TROUT POPULATIONS. Trans. Amer. Fish. Soc., 103(2): 353-355.

Corrections are made to an earlier paper by Jensen (1971). The predicted yield from an unstable population is compared to that from a stable population. It is shown that an unstable population will reach a stable structure, following which the yield will not fluctuate but go steadily down. Data from the population indicate that it is on its way towards extinction, even without additional mortality imposed on any age group. (Auth.)

18055. Ragotzkie, Robert A. (Mar. Studies Center, Univ. of Wisconsin, Madison Wisconsin 53706). 1974. THE GREAT LAKES REDISCOVERED. Am. Sci., 62(4): 454-464.

Valued most when their resources are most imperiled, the Laurentian Great Lakes can be preserved only by vigorous research and management efforts. (Auth.)

18056. Beamish, F. W. H. (Dept. of Zool., Univ. of Guelph, Guelph, Ontario, Canada). 1974. SWIMMING PERFORMANCE OF ADULT SEA LAMPREY, Petromyzon marinus, IN RELATION TO WEIGHT AND TEMPERATURE. Trans. Amer. Fish. Soc., 103(2): 355-358.

Distance (m) sea lampreys, Petromyzon marinus, swam increased with weight (2.4-106.9 g) but at a decreasing acceleration for a fixed velocity and temperature. Distance declined with increase in swimming speed between 20-60 cm/sec at a decreasing acceleration. The greatest distance was recorded for the largest lampreys at the lowest swimming speeds. Distance increased with temperature between 5-15 C. Performance of sea lampreys was less than that for teleosts which may be related to differences in their morphology. (Auth.)

18057. Holmquist, Charlotte (Sekt. f. evertebratzoologi, Naturhistoriska Riksmuset, S-104 05 Stockholm 50, Sweden). 1974. A FISH LEECH OF THE GENUS Acanthobdella FOUND IN NORTH AMERICA. Hydrobiologia, 44(2-3): 241-245.

A specimen of Acanthobdella, which parasitize salmonids, is described from Chandler Lake, Alaska.

18058. Sekizawa, Yashuharu, Akira Suzuki, Kunitaka Tachibana, and Takahiko Kikuchi (Lab. Biol., Res. Labs, Meiji Seika Kaisha. Ltd., Morooka-cho, Kohoku-ku, Yokohama, Japan). 1974. ACTION MECHANISM OF 2-AMINO-4-PHENYLTHIAZOLE, A PISCINE ANESTHETIC, UPON THE CENTRAL NERVOUS SYSTEM OF CARP. Bull. Jap. Soc. Sci. Fish., 40(4): 351-361. In English.

The physio-chemical characteristics of a sedative, 2-amino-4-phenylthiazole, as to its anesthetic properties upon carp (Cyprinus carpio) were surveyed. (1) EEG activation by acetylcholine chloride administered into the cerebellum was observed under concomitant debilitation of EEG from the cerebellum by anesthetization. EEG activation was also observed by serotonin-creatinine sulfate or dopamine hydrochloride, but not by noradrenaline hydrochloride. (2) This compound gave neither extreme activation nor inhibition upon the monoamine oxidase (EC 1.4.3.4) or acetylcholine hydrolase (EC 3.1.1.7) activity. (3) The depletion of acetylcholine in the nerve ending particles was observed under anesthetization. The depletion of serotonin or dopamine was not observed. It might be concluded that the depletion of acetylcholine resulted in the inhibition of choline o-acetyltransferase (EC 2.3.1.6) activity and the abatement of acetylcholine binding capacity of the synaptic vesicles in the presence of this compound. (4) The brain cAMP was observed to be increased by the anesthetization. Although the implications as for the augmentation of brain cAMP was not yet fully elucidated, it was concluded that the augmentation resulted from inhibition of cAMP phosphodiesterase (EC 3.1.4.1) activity in the presence of this compound.

18059. Kroger, Richard L. (Dept. of Zool. and Physiol., Univ. of Wyoming, Laramie, Wyoming 82070). 1974. INVERTEBRATE DRIFT IN THE SNAKE RIVER, WYOMING. Hydrobiologia, 44(4): 369-380.

Drifting invertebrates were collected hourly during 24-hour sampling periods at two stations in the Snake River. The greatest number of invertebrates was collected on 8 and 15 July 1966 at station 1 between 9:00 p.m. and 12 midnight, then the numbers gradually decreased until the low daylight drift rate was reached at dawn. On 26 and 27 August 1966 at station 2, the diel periodicities of drifting invertebrates were different than at station 1. Many species increased their drift rates slightly during the first hour of darkness but also exhibited a higher drift peak later in the night. Drift indices for 25 taxonomic groups of invertebrates were established from the ratio of standing crop, estimated from Surber samples, to numbers drifting. There was more apparent correlation between species life cycle stage and numbers drifting than between species abundance and numbers drifting. (Auth.)

18060. Pollard, D. A. (Dept. of Zool. and Comp. Physiol., Monash Univ., Clayton, Vic. 3168, Australia). 1974. THE BIOLOGY OF A LANDLOCKED FORM OF THE NORMALLY CATADROMOUS SALMONIFORM FISH Galaxias maculatus (Jenyns) VI. EFFECTS OF CESTODE AND NEMATODE PARASITES. Aust. J. Mar. Freshwater Res., 25(1): 105-120.

18061. Plumb, J. A., J. H. Schachte, J. L. Gaines, W. Peltier, and B. Carroll (Dept. of Fish. & Allied Aquacultures, Alabama Agric. Exp. Sta., Auburn Univ., Auburn, Alabama 36830). 1974. Streptococcus SP. FROM MARINE FISHES ALONG THE ALABAMA AND NORTHWEST FLORIDA COAST OF THE GULF OF MEXICO. Trans. Amer. Fish. Soc., 103(2): 358-361.

Fish kills in estuarine bays along the Florida and Alabama Gulf Coast were investigated in August and September 1972. Eight species of moribund fish were examined. A nonhemolytic, group B, type I_b Streptococcus sp. was isolated from over 90% of the fish examined. Parasites and toxicants were eliminated as possible causes of the kills. (Authors)

18062. Marangos, Paul J., and Spiros M. Constantinides (Dept. of Biochem. and Dept. of Food and Nutr. Sci., Univ. of Rhode Island, Kingston, Rhode Island 02881). 1974. MULTIPLE FORMS OF FLOUNDER MUSCLE GLYCERALDEHYDE 3-PHOSPHATE DEHYDROGENASE. SUBUNIT COMPOSITION, PROPERTIES, AND TISSUE DISTRIBUTION OF THE FORMS. J. Biol. Chem., 249(3): 951-958.

18063. Kusuda, Riichi, Hideo Taki, and Terufumi Takeuchi (Dept. of Cultural Fisheries, Fac. of Agric., Kochi Univ., Nangoku, Kochi Pref., Japan). 1974. STUDIES ON A NOCARDIA INFECTION OF CULTURED YELLOWTAIL - II. CHARACTERISTICS OF Nocardia kampachi ISOLATED FROM A GILL-TUBERCULOSIS OF YELLOWTAIL. Bull. Jap. Soc. Sci. Fish., 40(4): 369-373. In Japanese.

A gill-tuberculosis of cultured yellowtail, Seriola quinqueradiata, which occurred from late autumn of 1971 till the following spring in both Tosashimizu and Tanabe bays are described in the paper. The causal organism was found to be a gram-positive, non-motile rod which occasionally showed branching, and was feebly acid-fast. It was non-sporing, and produced aerial hyphae. Catalase, hydrogensulfide production, starch hydrolysis, and nitrate reduction were positive. Decomposition of hypoxanthine and tyrosin was feebly positive. Tests for oxidase, urease, indole production, gelatin liquefaction, and decomposition of casein and xanthine were negative. It was able to produce acids from glucose, fructose, and glycerol on a medium containing sodium glutamate as the nitrogen source. The organism utilized the acetate, citrate, fumarate, and pyruvate, but not the benzonate, oxalate, propionate, and tartrate on a medium containing diammonium hydrogen phosphate as the nitrogen source. It showed growth neither at 10°C nor 37°C and survived at 50°C for 4 hours in the nutrient broth. On comparison with a strain from nocardiosis of yellowtail it was apparent that the gill-tuberculosis organism was Nocardia kampachi.

18064. Brusven, M. A., and C. MacPhee (Dept. of Entomol., Univ. of Idaho, Moscow, Idaho 83843). 1974. AN EVALUATION OF SQUOXIN ON INSECT DRIFT. Trans. Amer. Fish. Soc., 103(2): 362-365.

An analysis of 54 drift net samples obtained over a 72-hr period in riffle areas of the St. Joe River, Idaho, showed that a distributed concentration of 0.1 mg/liter (100 parts per billion) of 1,1'-methylenedi-2-naphthol for a 13-hr period cause no significant increase in insect drift during the sampling period. Eight species of insects in the orders Trichoptera and Ephemeroptera represented 87% of the total drift insects. All species drifted in greater abundance during the night. (Authors)

18065. Cairns, John, Jr., Guy R. Lanza, and Bruce C. Parker (Limnol. Dept. Acad. of Nat. Sci. and Center for Environ. Studies, Virginia Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1972. POLLUTION RELATED STRUCTURAL AND FUNCTIONAL CHANGES IN AQUATIC COMMUNITIES WITH EMPHASIS ON FRESHWATER ALGAE AND PROTOZOA. Proc. Acad. Nat. Sci. Phila., 124(5): 79-127.

This paper includes a discussion of certain select aspects of structural and functional changes in algal and protozoan communities and how they relate to the assessment and solution of pollution related problems. New methods and concepts developed by the authors are related to older methods and concepts. The various types of pollutional stress are discussed together with their effects on algal and protozoan communities. (Authors)

18066. Emery, Richard M. (Battelle Northwest Labs., Ecosystems Dept., Richland, Washington 99352). 1974. AN OBSERVATION OF AN ASSOCIATION BETWEEN ADAPTIVE PIGMENTATION AND THERMAL TOLERANCE OF FISH. Hydrobiologia, 44(4): 511-516.

Replidated experiments indicate an association between thermal tolerance of juvenile bluegill sunfish and adaptive pigmentation to background color. Bluegills exposed to black backgrounds were able to survive higher temperatures longer than those exposed to blond backgrounds, when water temperatures were raised at a rate of 0.1° C/h from 24 to 36° C. Plausible explanations are considered which involve heat radiation effectiveness (by the fish) related to the black body concept, and stress associated with adaptive pigmentation. (Auth.)

18067. Hyde, Kenneth M., Sammy Stokes, James F. Fowler, Jerry B. Graves, and Frances L. Bonner (Dept. of Entomol., Louisiana State Univ., Baton Rouge, Louisiana 70803). 1974. THE EFFECT OF MIREX ON CHANNEL CATFISH PRODUCTION. Trans. Amer. Fish. Soc., 103(2): 366-369.

Three applications of mirex bait (0.3% technical material) were made at the rate of 1.4 kg per ha to four ponds containing channel catfish, Ictalurus punctatus (Rafinesque). Percent survival, weight, and length of fish reared in the treated ponds were not significantly different ($P > 0.05$) from that observed in fish from four untreated ponds. However, percent survival in the mirex treated ponds was significantly less than in the untreated ponds at the $P < 0.10$ level and approached significance at the $P < 0.05$ level. After final application of mirex, residues in fish from treated ponds averaged 0.015 μg/g in fillets and 0.255 μg/g in fat. Based on the fat content of fillets and assuming that all mirex is present in the fat, the observed average residue in fillets (0.015 μg/g) would be equivalent to 0.49 μg/g in fat of meat, well above the government established tolerance of 0.1 μg/g in fat of red meat. (Authors)

18068. Hopkins, Carl D. (Dept. of Ecol. and Behav. Biol., James Ford Bell Museum of Nat. Hist., Univ. of Minnesota, Minneapolis, Minnesota 55455). 1974. ELECTRIC COMMUNICATION IN FISH. Am. Sci., 62(4): 426-437.

Certain species of fish produce electric signals that are used for identification, aggregation, and dispersal. (Auth.)

18069. Imura, Koji (Maruho Co. Ltd., Oyodo Kenkyusho, Oyodo-cho, Oyodo-ku, Osaka, Japan). 1974. ON THE ALKALINE RNase ISOLATED FROM THE PYLORIC CAECA OF RAINBOW TROUT. Bull. Jap. Soc. Sci. Fish., 40(4): 399-408. In Japanese.

The alkaline RNA-depolymerase in the pyloric caeca of rainbow trout was purified about 160 fold in order to study the properties of this enzyme. The purified enzyme was free from the phosphomonoesterases and the phosphodiesterase while only a little alkaline DNase activity was observed. The optimum pH for the enzyme activity was approximately 8.5 in the Tris-HCl buffer. The enzyme was inactivated irreversibly under Ca^{++} free conditions. Mg^{++}, Ba^{++}, K^{+} and Na^{+} did not show any effects on the enzyme activity at 4 mM concentration, whereas Co^{++}, Cd^{++} and Hg^{++} inhibited remarkably at the same concentration. The enzyme digested RNA completely to the acid soluble fraction. In the digestion products of the RNA, four kinds of mononucleotides, i.e. CMP, UMP, AMP and GMP, were found. In the digestion test using homopolynucleotide as the substrate, the enzyme hydrolyzed the polynucleotide forming the 2':3' cyclic nucleotide. It was confirmed from these specificities that, among the various RNA-depolymerases, this enzyme can be classified as an RNase (EC. 2.7.7.17).

18070. Thorp, V. J., and P. S. Lake (Dept. of Zool., Univ. of Adelaide, Adelaide, S. A. 5000, Australia). 1974. TOXICITY BIOASSAYS OF CADMIUM ON SELECTED FRESHWATER INVERTEBRATES AND THE INTERACTION OF CADMIUM AND ZINC ON THE FRESHWATER SHRIMP, Paratya tasmaniensis Riek. Aust. J. Mar. Freshwater Res., 25(1): 97-104.

18071. Zeitoun, Ibrahim H., and Peter I. Tack (Dept. of Fish. & Wildl., Mich. State Univ., East Lansing, Michigan 48823). 1974. THE EMBRYOLOGY OF THE COHO SALMON, Oncorhynchus kisutch (Walbaum). Trans. Amer. Fish. Soc., 103(2): 371-375.

The early development of the coho salmon, Oncorhynchus kisutch, is similar to that of the chum salmon, Oncorhynchus keta, as already described in the literature. This study of the coho salmon begins at the closure of the blastopore where the work of previous investigators terminates. At the closure of the blastopore lips the primitive organ systems were established. Following yolk sac formation the divided brain, differentiated sensory organs, gill arches, pectoral fins, and the twisting of the heart were evident. Alevins hatched after 40 days of incubation at 10 ± 1 C, or after the eggs were subjected to approximately 720 Fahrenheit thermal units. (Authors)

18072. Berg, A. (Biol. Div., Euratom, 21020 Ispra, Italy). 1972. STUDIES ON THE METABOLISM OF CALCIUM AND STRONTIUM IN FRESHWATER FISH. IV. CALCIUM AND STRONTIUM RELATIONSHIPS IN FISHES OF TWO NORTHERN ITALIAN LAKES AND THEIR GENERAL RADIOECOLOGICAL IMPLICATIONS. Mem. Ist. Ital. Idrobiol., 29: 145-167.

From the analyses of fish and water samples collected in two Northern Italian lakes, it is shown that Ca concentration in bony structures of fish is strongly regulated while Sr concentration exhibits great variations according to species, lake and season. The decrease of the "observed ratio" Sr/Ca in summer is discussed on the basis of information obtained from previous experiments in the laboratory. On the other hand, Ca and Sr analyses on the total body made on 16 fish species of Lake Maggiore permit the correlation between their Ca content and the contribution of scales and bones to total dry weight and to get a better understanding of the causes of variability of Ca and Sr accumulation parameters according to species, type of water and season. (Auth.)

18073. Hubbs, Clark, Chris Bryan (Dept. of Zool., The Univ. of Texas at Austin, Austin, Texas 78712). 1974. MAXIMUM INCUBATION TEMPERATURE OF THE THREADFIN SHAD, Dorosoma petenense. Trans. Amer. Fish. Soc., 103(2): 369-371.

Eggs of the threadfin shad (Dorosoma petenense) can gastrulate at temperatures up to 36 C. Successful incubation seems to be limited to temperatures below 34.2 C. (Authors)

18074. Shcherbakov, Yu. A., and I. V. Poluboyarinova (Sci. Res. Inst. of Lake and River Fish Farming, Saratov, USSR). 1970. STABILITY OF THE BUTYL ESTER OF 2,4-D IN WATER AND ITS POSSIBLE ACCUMULATION IN AQUATIC ORGANISMS. In: Eksperimental'naya Vodnaya Toksikologiya Materialy Vsesoyuznogo Simposiuma (1st), 32-35; from: Health Aspects of Pesticides, 72-2301; Weed Abstracts, 23(2): abstract 359, p. 41.

Pond water containing 2,4-D butyl ester at 0.015-0.2 mg/litre caused massive fish death. 2,4-D butyl ester was detected in fish muscular tissues and in soil, plants and aquatic organisms and hydrolyzed within 9-10 days to 2,4-D acid. Carp living in water containing ester at 0.5 mg/litre accumulated 32.4 mg/kg by the third and 197.8 mg/kg by the seventh day of exposure. Fish living in water containing ester at 0.05 mg/litre accumulated 34.8 mg/kg by the seventh day. Traces of 2,4-D butyl ester and 2,4-D acid were detected in fish living in water containing ester at 0.025-0.006 mg/litre after two months. Daphnia were less sensitive to 2,4-D butyl ester than fish. A maximum permissible concn. of 0.006 mg/litre is recommended in fisheries.

18075. U. S. Department of Commerce, NOAA, NMFS. 1974. PROCEEDINGS OF THE FIRST U.S.-JAPAN MEETING ON AQUACULTURE AT TOKYO, JAPAN, OCTOBER 18-19, 1971. NOAA Technical Report NMFS CIRC-388, 121 p., illus.

18076. Schreck, Carl B., and M. Lloyd Hopwood (Colorado Coop. Fish. Unit., Colo. State Univ., Fort Collins, Colorado 80521). 1974. SEASONAL ANDROGEN AND ESTROGEN PATTERNS IN THE GOLDFISH, Carassius auratus. Trans. Amer. Fish. Soc., 103(2): 375-378.

Monthly plasma androgen levels of male and female adult goldfish (Carassius auratus), determined by competitive protein binding assay, followed patterns corresponding to seasonal environmental fluctuations. Highest androgen levels (ca 33 ng/ml) occurred during the spawning season, and lowest concentrations (ca 9 ng/ml) were found in winter. Monthly plasma estrogen patterns, determined by radioimmunoassay, remained stable for the year at approximately 1.5 ng/ml in the male. Estrogen levels in the female paralleled those of the androgens with mean concentrations of approximately 10.0 ng/ml in summer and 0.9 ng/ml in winter. (Authors)

18077. Berg, A., and N. Verheyden (Biol. Div., Euratom, 21020 Ispra, Italy). 1972. PHYSIOLOGICAL EFFECT OF SUBLETHAL DOSES OF METALLIC POLLUTANTS AND OF DETERGENTS ON FRESHWATER FISH: MODIFICATION OF THE EXCHANGE RATE OF CALCIUM FROM WATER. (Effet physiologique de doses sublethales de polluants metalliques et de detergents sur le poisson d'eau douce: modification du taux d'echange de calcium a partir de l'eau). Proc. Intern. Symp. Radioecology applied to the protection of man and his environment, Commission of the European Communities, (EUR 4800 d-f-i-e), pp. 759-771.

Goldfish (Carassius auratus, L.) and sunfish (Lepomis gibbosus, L.) were exposed during 9-15 days to different sublethal concentrations of Zn^{++} (0.5 ppm), Hg^{++} (0.05 ppm) and ABS (2.5 ppm) added to freshwater of low (4-10 ppm) and normal (20 ppm) calcium concentrations. In these conditions, the behaviour of the fish and their rate of food consumption were normal. Nevertheless, the exchange rate of calcium from water, as put into evidence by whole body counting using Sr^{85} as an indicator of calcium metabolism, was significantly lowered (to 50% of the normal value). This inhibition at the level of the exchange rate is the consequence of a still stronger inhibition at the level of the gill absorption rate. In various cases, a gradual acclimation to the pollutants has been put into evidence. These results indicate that the method could find interesting application in bioassays concerned with sublethal effects of pollutants. (Authors' summ.)

18078. Cairns, John, Jr., John S. Crossman, Kenneth L. Dickson, and Edwin E. Herricks (Dept. of Biol. and Center for Environ. Studies, Virginia Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1973. THE EFFECT OF MAJOR INDUSTRIAL SPILLS UPON STREAM ORGANISMS. Preprinted for the 26th Purdue Industrial Waste Conf., May 4 - 6, 1971 -- published in the Purdue Univ. Engineering Bulletin, 140(1): 156-170.

The effects of an abrupt acute stress from an industrial spill of ethyl benzene and creosote was to decrease the diversity and density of both the fish and bottom fauna for a distance of approximately 3 miles below the site of the spill. A differential response to the stress was apparent with all major groups of fish except the minnows being entirely eliminated in the stressed area. Perhaps the minnows avoided the stress by swimming into small isolated tributaries or rapidly reinvaded the area or are more tolerant to this type of stress. Mayflies, stoneflies, caddisflies and mussels could not survive the stress and were eliminated. However, mayflies and stoneflies appear to be rapid reinvaders while the others appear to have more than six months to reinvade. Riffle beetles, trueflies, crayfish, some snails and segmented worms were able to survive the short term exposure of this type stress. (Authors' summ.)

18079. Drummond, Robert A., and Walter F. Dawson (U.S. Environ. Protection Agency, Natl Water Qual. Lab., 6201 Congdon Blvd. Duluth, Minnesota 55804). 1974. AN INEXPENSIVE SOLID-STATE AMPLIFIER FOR DETECTING MOVEMENTS AND ELECTRICAL POTENTIALS OF FISH. Trans. Amer. Fish. Soc., 103(2): 391-392.

A device for indirectly monitoring opercular frequency, 'coughs,' locomotor activity and heart rate of fish is described. (Authors)

18080. Armour, Carl L. (Idaho Coop. Fish. Unit, Univ. of Idaho, Moscow, Idaho). 1974. SERUM ANTIGENIC DIFFERENCES IN SPRING CHINOOK SALMON (Oncorhynchus tshawytscha) FROM TWO SEPARATE RIVERS. Trans. Amer. Fish. Soc., 103(2): 379-382.

A total of 208 serum specimens from adult spring chinook salmon (Oncorhynchus tshawytscha) native to the Upper Snake River system and the Willamette River in Oregon were compared by immunodiffusion and immunoelectrophoresis with rabbit immune sera. Inter-group differences of antigens were not detected by immunodiffusion. One immunoprecipitate pattern which formed distally toward the anode end of slides in immunoelectrophoresis tests occurred in a high frequency (110 out of 114 in Willamette River samples) and very low frequency (2 out of 94) in Snake River samples. Apparently the antigen was less concentrated in serum of fish from the Snake River, possibly reflecting a physiological change. The difference was not found in samples from juveniles from the two rivers. A globulin found by immunoelectrophoresis occurred in different frequencies in juveniles; 28 of 34 fish from the Willamette River were positive, and only 1 fish of 36 from the Snake River was positive. Immunoelectrophoretic inhibition demonstrated the difference to be quantitative rather than qualitative. (Auth.)

18081. Greenland, Donald C., and Robert L. Gill (U.S. Fish & Wildlife Service, Fish Farming Development Center, Rohwer, Arkansas 71666). 1974. TRAPPING POND-RAISED CHANNEL CATFISH. Prog. Fish-Cult., 36(2): 72-77.

Traps were tested to determine if they could be used for harvesting channel catfish (Ictalurus punctatus) from farm ponds. Small traps constructed around demand feeders were not effective. Larger trapping enclosures successfully captured large quantities of fish. Catches of up to 1,714 kg (3,780 lb) and 3,484 kg (7,680 lb) were made with two types of trapping enclosures, panel traps, and "drop-seines." The panel traps were constructed of wire-covered wooden frames and the drop-seines were formed of nylon webbing. These enclosures were set in a semicircle around feeding stations. Fish were captured as they entered the enclosures to feed. Once catfish became accustomed to the presence of the gear, the traps could be fished every 3 to 7 days. (Authors)

18082. Weaver, James E. (Virginia Inst. of Mar. Sci., Gloucester Point, Virginia 23062). 1974. TEMPORAL TRENDS IN FATTY ACID COMPOSITION OF JUVENILE ATLANTIC MENHADEN FED BRINE SHRIMP NAUPLII. Trans. Amer. Fish. Soc., 103(2): 382-386.

Changes in relative proportions of neutral and total lipid fatty acids in juvenile Atlantic menhaden were progressively reflected during a controlled feeding experiment. The 14:0, 16:0, 16:1 and 18:1 fatty acids were predominant in the neutral and total lipids of a freshly captured fish, whereas the 18:1 and 18:3 ω3/20:1ω9 acids were predominant in the neutral and total lipids of cultured brine shrimp nauplii. The relative percentages of 14:0, 16:0 and 16:1 acids in menhaden decreased markedly during the 6 weeks of feeding on nauplii, while the percentages of 18:1 and 18:3 ω3/20:1 ω 9 acids increased significantly. (Auth.)

18083. Heidinger, Roy C., and John B. Stahl (Dept. of Zool., Southern Illinois Univ., Carbondale, Illinois 62901). 1974. A PORTABLE APPARATUS FOR PRESSURE SIEVING BOTTOM SAMPLES. Prog. Fish-Cult., 36(2): 116-117.

A portable apparatus is described that permits pressure sieving bottom samples from a small boat at the sampling site. (Authors)

18084. Hansen, Randall G. (Coll. of Fish., Univ. of Washington, Seattle, Washington 98195). 1974. EFFECT OF DIFFERENT FILAMENT DIAMETERS ON THE SELECTIVE ACTION OF MONOFILAMENT GILL NETS. Trans. Amer. Fish. Soc., 103(2): 386-387.

Two filament diameters with the same mesh size of 38.1-mm stretch mesh monofilament gill nets were compared for catches of peamouth and yellow perch. In both cases, the smaller filament diameter captured larger fish. (Auth.)

18085. Nash, Colin E. (Oceanic Inst., Waimanalo, Hawaii 96795). 1974. RESIDUAL CHLORINE RETENTION AND POWER PLANT FISH FARMS. Prog. Fish-Cult., 36(2): 92-95.

The determination of chlorine residual in the chlorinated condenser cooling water supplied to a fish farm at a coastal electrical generating plant is an important part of farm management. The paper describes in general terms the present understanding of the problems associated with dissolved chlorine retention in fish enclosures using treated condenser cooling water from a power plant. Seawater for a farm site is usually piped from one or more convenient locations so that a continuous supply is guaranteed. In a multi-outlet system, the levels of residual chlorine in the separate culverts can differ, and the level of free residual chlorine in the main water supply to the site is influenced by the different levels. Under the normal chlorine injection conditions of a power plant, the free residual chlorine level in seawater passing to a site is between 0.02 and 0.10 ppm. For the normal conditions of low flow rate through enclosures containing fish, namely 2-6 changes in volume per day, there is little chance of a high level of free residual chlorine being detected in the enclosures. Increases in free residual chlorine level above normal are buffered by conditions in the enclosure. The retention of the chlorine residual in an enclosure containing fish appears to be dependent on a dynamic interaction between water flow rate, the natural chlorine demand of the organic matter present, and physical factors of the atmosphere. (Auth.)

18086. Brigham, Warren U. (Illinois Nat. Hist. Survey, Urbana, Illinois 61801). 1974. JOURNAL COVERAGE BY NORTH AMERICAN FISHERY BIOLOGISTS. Trans. Amer. Fish. Soc., 103(2): 387-389.

Utilizing the "most cited journal" method, it was determined that 24 periodicals yielded 50% coverage of fishery biology by North American workers. One hundred and six periodicals yielded 75% coverage. Chronologically, a 9-year time span yielded 50% coverage and a 17-year time span yielded 75% coverage. Most papers became obsolete after 25 years. (Auth.)

Correction:

Volume 18, Number 4, Abstract No. 16777. Author and pages should have been cited as: Massengill, Ronald R. (Essex Marine Laboratory, Inc., Novelty Lane, Essex, Connecticut 06426); pp. 138-141.

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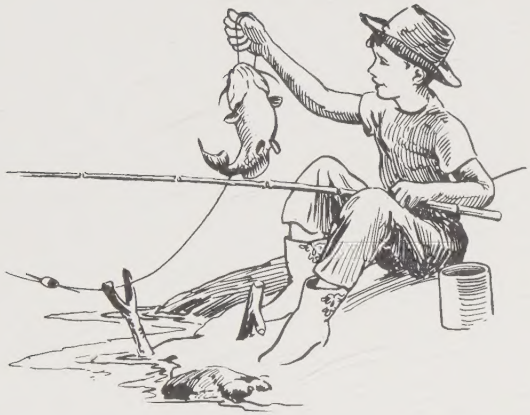

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